

BONUS SHOP GUIDE: GREAT PROJECTS YOU MAKE FOR YOU

JULY 1987

\$1.95

Popular Mechanics

**'HOW I
BOMBED
QADDAFI'**



**An Eyewitness
Report From The
Cockpit By An
Air Force Officer
Who Flew
The Mission**

TV's HOTTEST WHEELS

THE CARS OF MIAMI VICE

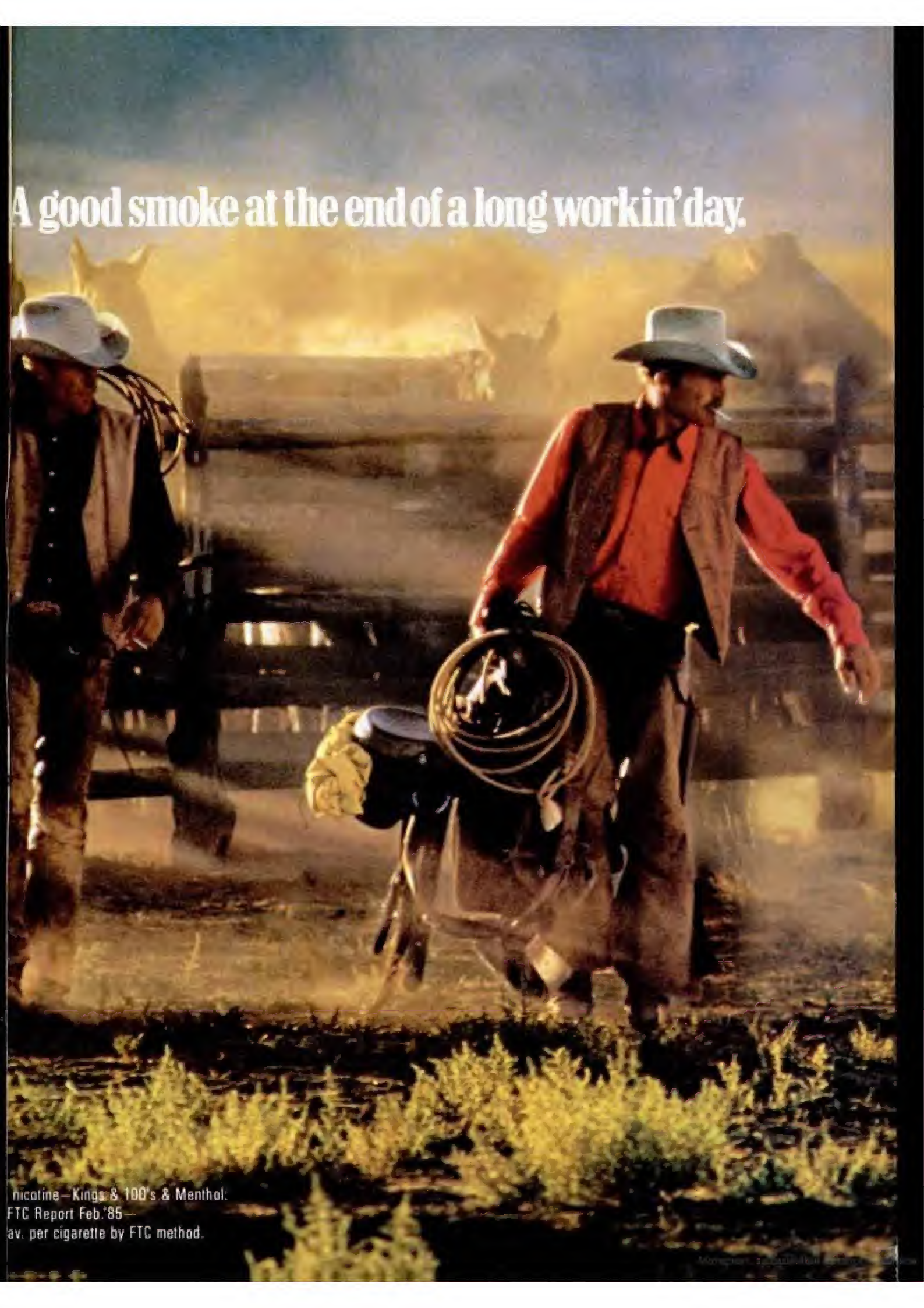


**Don Johnson And
His "Miami Vice" Toys**

MUSCLE BOATS

**Full Throttle In 5 Of America's
Fastest Water Scorchers**



A full-page photograph of two cowboys in a dusty corral at sunset. The cowboy on the right is in the foreground, wearing a red shirt, a brown vest, and a light-colored cowboy hat. He is holding a coiled lasso and a yellow jacket. The cowboy on the left is partially visible, wearing a dark shirt and a light-colored cowboy hat. In the background, there is a wooden fence and several cow heads mounted on the wall. The sky is a mix of orange, yellow, and blue, suggesting the time is dusk. The overall mood is rugged and nostalgic.

A good smoke at the end of a long workin' day.

nicotine—Kings & 100's & Menthol:
FTC Report Feb.'85—
av. per cigarette by FTC method.

©1985 Philip Morris Inc. All rights reserved.

1. Follow instructions on the other side

Back

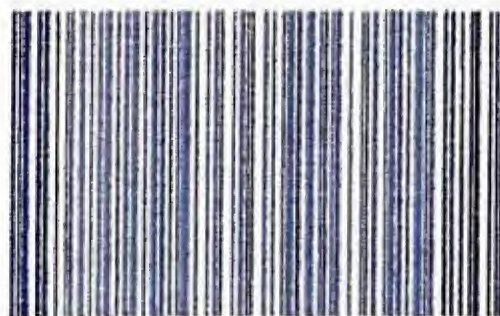
GBS1116Back-001B



Inverted Back

1. Follow instructions on the other side

Folded edge of the page



Foldout slip-sheet

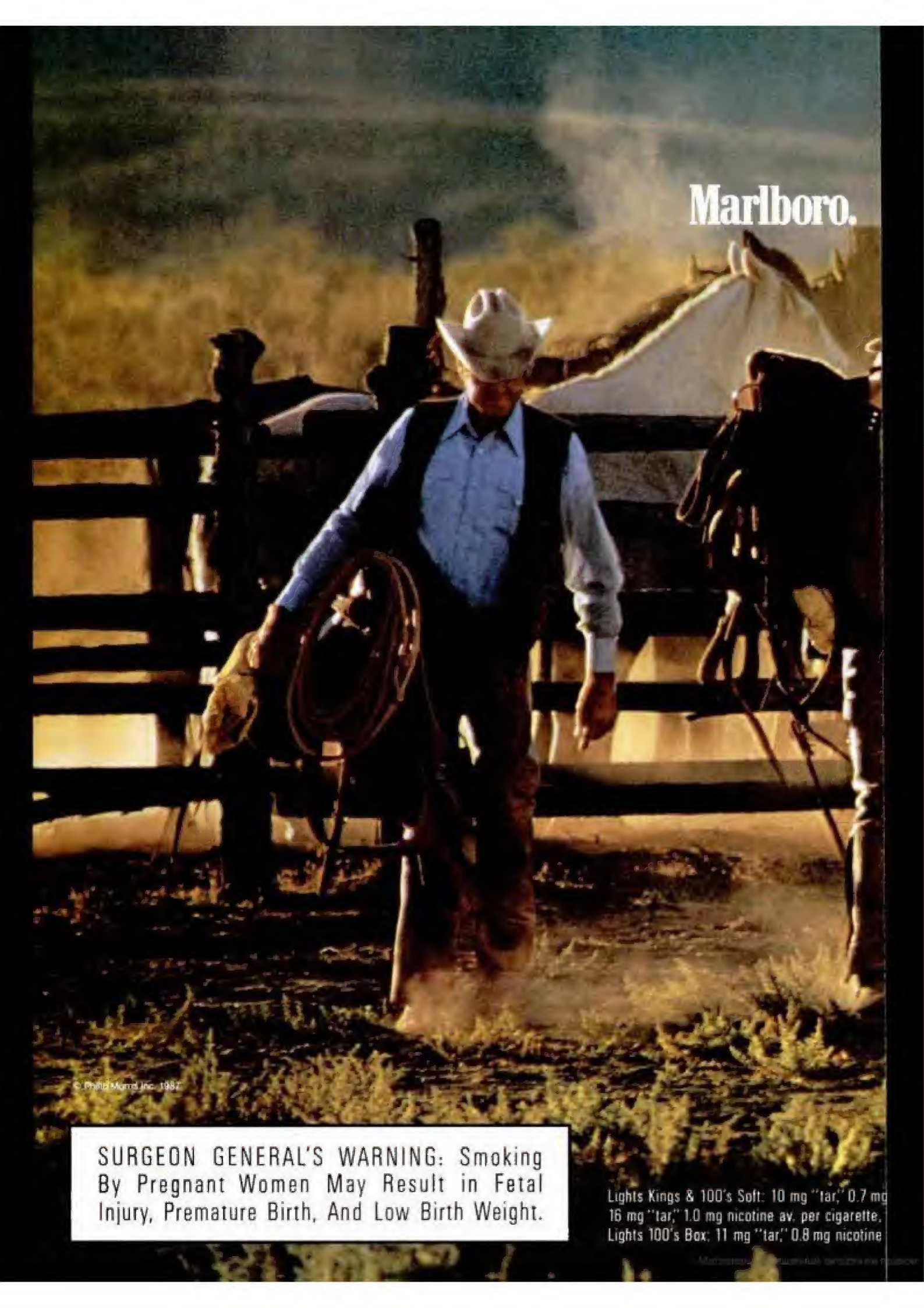
1. Open the foldout page
2. Insert this sheet with
 1. Front side touching the free page
 2. Arrow pointing to the fold
 3. Slice the folded edge
 4. Close the page and slip-sheet



Inverted Foldout slip-sheet

1. Open the foldout page
2. Insert this sheet with
 1. Front side touching the free page
 2. Arrow pointing to the fold
 3. Slice the folded edge
 4. Close the page and slip-sheet





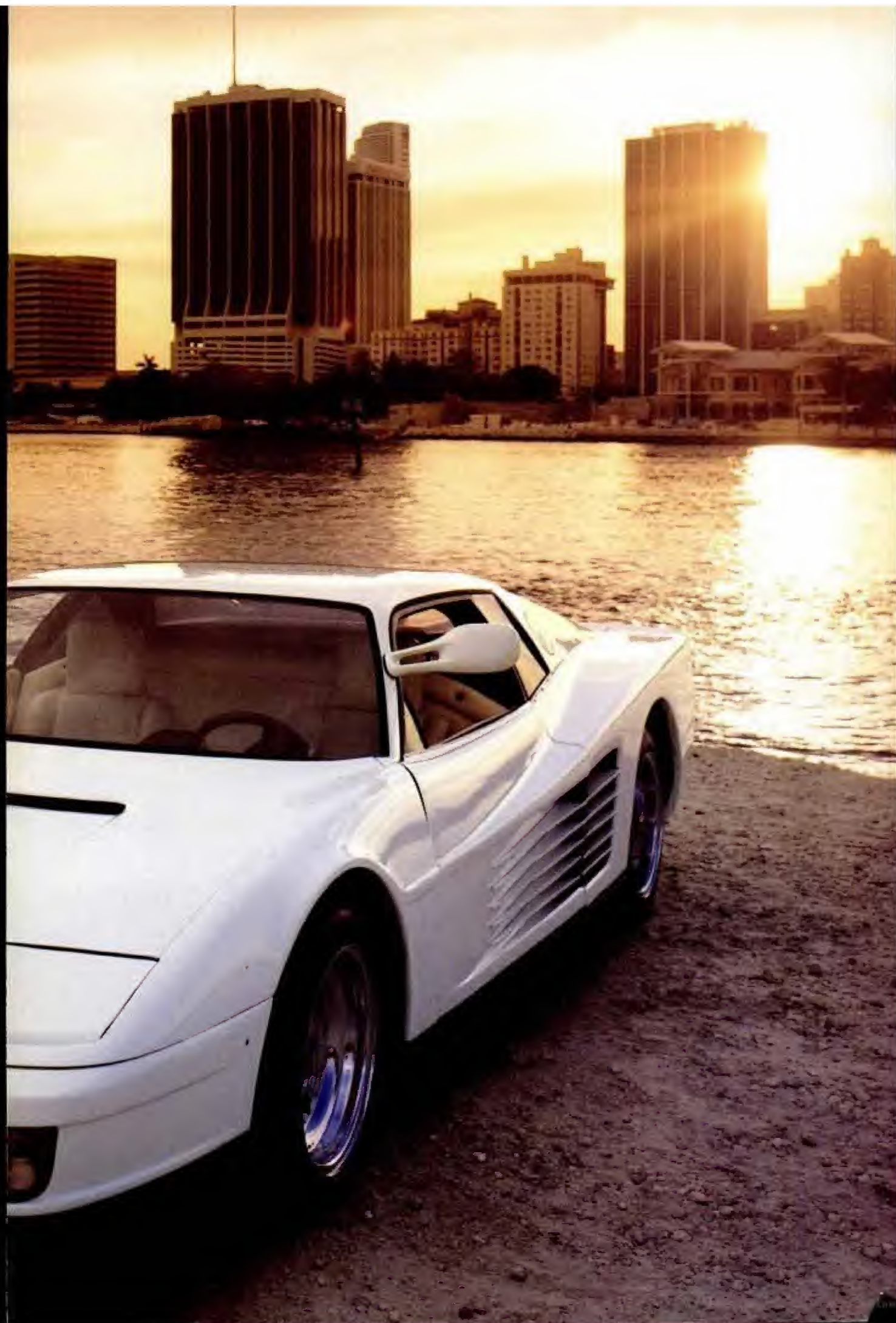
Marlboro.

© Philip Morris Inc. 1987

SURGEON GENERAL'S WARNING: Smoking By Pregnant Women May Result in Fetal Injury, Premature Birth, And Low Birth Weight.

Lights Kings & 100's Soft: 10 mg "tar," 0.7 mg nicotine av. per cigarette.
Lights 100's Box: 11 mg "tar," 0.8 mg nicotine av. per cigarette.

Marlboro and the chevron are registered trademarks of Philip Morris Inc.





6

This One



5HWW-QS2-9EKO

AMERICA It Still Works.



DICKIES The Brand It Works In.

Dickies, for a complete line of work clothes, jackets, jeans, shirts, thermal underwear, socks, work boots, gloves, caps, belts and leather goods.

© 1987 Williamson-Dickie Manufacturing, Inc.



85 COVER STORY

A sort of cult program for car lovers, "Miami Vice" exhibits rare and unusual wheels that set the show's tone and establish the unique style. Get a behind-the-scenes look at these conceptual engineering innovations in our exclusive story.

—PM photo by
Brian King and
Nancy Ellison/Sygma



95 Gotcha!



90 Asian Invasion



110 'How I bombed Qaddafi'



102 Muscle boats

DEPARTMENTS

- | | |
|------------------|------------------------|
| 4 Editor's Notes | 46 Electronics |
| 7 Letters | 51 Inside Detroit |
| 10 Imports | 56 Science |
| 12 Outdoors | 62 Hints |
| 16 Freewheeling | 64 New/Home |
| 33 Workshop | 66 New/Auto |
| Minicourse | 70 Car Clinic |
| 35 Audio | 139 Homeowners' Clinic |
| 38 Photography | 140 Appliance Clinic |
| 44 Motorsports | 172 Time Machine |

SPECIAL SECTION: SHOPWORK GUIDE

115 Introduction

116 Benchmark

Build a flat, stable workbench for your shop.

124 One For All

Get stationary-tool performance from your portable power tools with our innovative power-tool table.

142 Piece-Keeper

Build our compact and portable small-parts cabinet.



SCIENCE/TECHNOLOGY

79 PM Tech Update

Read about the latest innovations, architecture, space, aviation, marine and energy.

110 'How I Bombed Qaddafi'

A U.S. Air Force Combat Pilot tells his personal account of an American blow against terrorism.

AUTOMOBILES

78 PM Long-Term Car Tests

Here's our report on the Nissan SE pickup, Ford Taurus LX and Oldsmobile Delta 88.

85 The Cars Of Miami Vice

Automotive engineering is the real star of this TV megahit.

90 Asian Invasion

We test 8 captive imports with rock-bottom prices and mixed parentage.

95 Gotcha!

We test 10 pocket-size radar detectors against the top-rated full-size Escort.

99 We Have A Winner!

A California reader drives off with a Nissan Hardbody V6 in our Customize-This-Truck contest.

149 Saturday Mechanic

Use our guide to troubleshoot your EGR system.

ELECTRONICS

106 Digital Audio Cassettes

How do they compare to the compact disc? We tell you in our exclusive test report on the first DAT recorders to hit the street in Japan.

BOATING/OUTDOORS

102 Muscle Boats

Five of America's hottest sport boats lock horns in a classic performance battle.

HOME/SHOP

133 The Better Home

Learn the pros and cons of home equity loans. And how to install a deadbolt lock.

Editor's Notes



To tell you the truth, I'm pretty sick of Don Johnson. I'm tired of hearing from all the women here in the office about what a hunk he is. I'm tired of seeing his rock videos on television. I'm tired of seeing him in Pepsi-Cola commercials. I mean, really. Can one guy be this good looking, this cool, this successful, and be *real*? The only thing about Don Johnson that I'm not tired of is his car on "Miami Vice." This year, it's a Ferrari Testarossa. For the past two years, it's been a Ferrari 365GTB4 Daytona Spyder. At least that's what I thought, until we started to research this month's cover story on all those fabulous cars you see every Friday night on "Miami Vice." As it turns out, the cars driven by Don Johnson aren't always quite what they appear to be. Some



One of the Liberty Squadron heroes.

of his "Ferraris" are replicas or kit cars or even built-from-scratch stunt cars. You'll also see everything from exotic imports to customized street machines to perfectly restored 1960s musclecars in any given episode of the show. And even if the plot stinks some weeks, if you're a car freak like me, "Miami Vice" can still be a treat for the eyes. . . . Since April 16, 1986, we've been trying to develop the article that begins on page 110. April 16, 1986 is the day after the bombing of Libya by U.S. Air Force and Navy planes. In all those months, our requests for interviews of pilots who flew the mission fell onto deaf ears at the Pentagon. "Can't do it for security reasons," was the usual reply. Then, suddenly, in April of this year, almost a year since the day of the original mission, attitudes changed. We suddenly received permission from the Department of Defense to speak not only to pilots who flew the mission, but even to the mission commanders. Our article, *How I Bombed Qaddafi*, is a first-person, eyewitness account of what it was really like in the cockpit of the lead F-111F that swooped in on Tripoli in those fateful minutes last year. Because there is still a fear that Qaddafi has death squads in this country trying to identify pilots who took part in the attack, we promised not to reveal the officer's name who wrote the article for us. Too bad. We like to give credit where it's due. And this Air Force officer is a hero in my book. . . . Those of you who read magazine mastheads will note lots of changes on ours this month. Let me bring you up to date on what's been going on around here. First, just when he was getting good at being our Boating/Outdoors Editor, we switched Tim Cole over to our Science/Technology/Aerospace Editor slot. Joining our staff several months ago as Aviation Contributing Editor is Fred Mackerodt, who flies a 1971 Piper Aztec Turbo and is multi-engine and instrument rated. Mackerodt will be giving you the pilot's-eye view of everything happening in sport aviation in the coming months.

Taking over Tim Cole's slot as the Boating/Outdoors Editor is Joe Skorupa, an avid outdoorsman and a guy who will be putting the pedal to the metal in all our future boat tests. Lastly, in our Editorial Production Department, Deborah Frank steps into the hot seat as Production Editor, no easy job. 'Til next time.

of his "Ferraris" are replicas or kit cars or even built-from-scratch stunt cars. You'll also see everything from exotic imports to customized street machines to perfectly restored 1960s musclecars in any given episode of the show. And even if the plot stinks some weeks, if you're a car freak like me, "Miami Vice" can still be a treat for the eyes. . . . Since April 16, 1986, we've been trying to develop the article that begins on page 110. April 16, 1986 is the day after the bombing of Libya by U.S. Air



Skorupa, Frank, Mackerodt.

Joe Oldham
Joe Oldham

Popular Mechanics

Editor-in-Chief

Joe Oldham

Managing Editor

Bill Hartford

Graphics Director

Bryan Canniff

Automotive

Wade A. Hoyt, SAE, editor
Jim Dunne, Detroit editor
Mike Allen, assistant editor
Michael Lamm, Norman S. Mayersohn,
Mort Schultz, Rich Taylor,
contributing editors

Home And Shop

Steven Willson, editor
Joseph Truini, shop and tools editor
Thomas Klenck, associate editor
Norman Becker, Rosario Capotosto,
Steve Toth, Bob Vila,
contributing editors

Electronics/Photography

Stephen A. Booth, editor
James B. Meigs, Frank Vizard,
contributing editors

Science/Technology/Aerospace

Timothy H. Cole, editor
Fred Mackerodt, contributing editor

Boating/Outdoors

Joe Skorupa, editor

West Coast

Steve Parker, editor

Editorial Production

John Bostonian Jr., art editor
Deborah Frank, production editor
Nancy Coggins, art assistant

Art

Alan Andresen, Ann Bennett,
associate art directors
Larry Sullivan, assistant art director

Editorial Administration

Josephine Caronia, administrative assistant
Barbara A. Novak, executive assistant

Editorial Offices

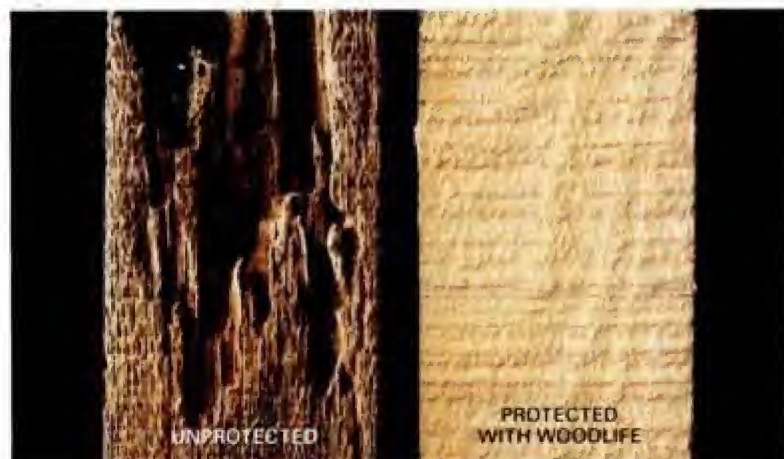
224 West 57th St., New York, NY 10019
We cannot be responsible for loss of unsolicited queries, manuscripts, or photos. For return, they must be accompanied by adequate postage.

SUBSCRIPTION SERVICE: Popular Mechanics Magazine will, upon receipt from its reader of a complete new or renewal subscription order, undertake fulfillment of that order so as to provide the first-copy delivery either to the Postal Service or alternate carriers within six to twelve weeks. If for some reason this cannot be done, you will be promptly notified of the issue date that will begin your subscription, with a request for any further instructions you may have concerning your order. Please address all such orders to us at Popular Mechanics, P.O. Box 10064, Des Moines, IA 50300. • Should you have any problem with your subscription, please write Joan Harris, Customer Service Department, Popular Mechanics, P.O. Box 10064, Des Moines, IA 50300 or call toll-free 1-800-247-5470; IA residents call 1-800-532-1272. Please enclose your mailing label when writing to us or renewing your subscription. • Renewal orders must be received at least eight weeks prior to expiration to assure continued service.

Use this address for subscription orders & inquiries. POPULAR MECHANICS, P.O. Box 10064 Des Moines, Iowa 50300.



**Want to
protect your
investments?
Use a brush.**



Wood after six years of outdoor exposure.

The price of wood has doubled in the past fifteen years. That makes the wood in your house, in your deck, in your fence a growth investment... unless it's been unprotected and exposed to the elements.

Unprotected wood will split and warp. It's a sure victim of rot, mildew and decay.

DAP® Woodlife® Clear Wood Preservative can prevent all this from happening. Its special formulation combines a water repellent with a wood preservative in a single product. In one application, Woodlife penetrates wood to protect it and extend its useful life.

So, a few brush strokes now can make the difference between a sound, secure investment and a major loss just a few years down the road.

No financial adviser can do better than that.

**Depend on
DAP®**



Popular Mechanics

Publisher

Daniel J. Coleman

Advertising Director

Floyd Sembler

National Sales Manager

Bud Gilbert

Advertising Offices

New York

224 West 57th St.
New York, NY 10019
(212) 262-8824

Chicago

1 South Wacker Dr.
Chicago, IL 60606
(312) 984-5190

Detroit

377 Fisher Rd.
Grosse Pointe, MI 48230
(313) 881-3520

Los Angeles

3000 Ocean Park Blvd.
Santa Monica, CA 90405
(213) 450-8881

Direct Response Advertising

Al Cohen

224 West 57th St.
New York, NY 10019
(212) 262-4279

Daniel Kellner

1 South Wacker Dr.
Chicago, IL 60606
(312) 984-5190

Business Manager

Agnes P. Maillaro

Marketing Director

Edward Vaquero

Production Manager

Lori Ellwood

Advertising Production

Patricia Woods
(212) 262-4800

Classified Sales Manager

Sophie Gronowicz
(212) 262-4825

Reader Service Department

Gary Frederick, supervisor
224 West 57th St., New York, NY 10019
(212) 262-4292

Published by The Hearst Corporation:

Frank A. Bennack Jr., President
Randolph A. Hearst, Chairman
Gilbert C. Maurer, President, Magazines Division
Richard E. Deems, Publishing Consultant

POPULAR MECHANICS is published monthly by the Hearst Corporation, 969 Eighth Avenue, New York, NY 10019, U.S.A. Frank A. Bennack Jr., President; Randolph A. Hearst, Chairman; Harvey L. Lipton, Vice-President and Secretary; Edwin A. Lewis, Vice-President and Treasurer. Hearst Magazines Division: Gilbert C. Maurer, President; K. Robert Brink, Executive Vice-President; George J. Green, Executive Vice-President; Mark F. Miller, Executive Vice-President, General Manager; Raymond J. Petersen, Executive Vice-President; Thomas J. Hughes, Vice-President & Resident Controller; Daniel J. Coleman, Vice-President for Popular Mechanics.

INTERNATIONAL EDITIONS: CARIBBEAN, MEXICO, SOUTHERN HEMISPHERE

AS A SERVICE TO READERS, Popular Mechanics publishes newsworthy products, techniques and scientific and technological developments. Due to possible variance in the quality and condition of materials and workmanship, Popular Mechanics cannot assume responsibility for proper application of techniques or proper and safe functioning of manufactured products or reader-built projects resulting from plans published in this magazine.

Letters



Dream Car Come True



Restored '66 Mustang convertible is the handiwork of Schlegel.

I want you to know what an inspiration **POPULAR MECHANICS'** May 1985 *Car Care Guide* was to me. Your feature *Affordable Dreams* (page 138) is the story that led me to choose an American car, 10 to 20 years old, to restore to like-new condition.

My choice of car was, as you can see from the photo, a Mustang convertible. I owned a '36 Ford convertible in college so the Mustang was a natural follow up.

I found the '66 in Chicago in the fall of '85, with 88,000 miles on its odometer. After checking over the sheetmetal with a magnet to see if any body putty was hiding collision damage, I took the convertible for a test drive. The exhaust manifold was blowing like a jet plane, but the car was actually in quite good condition—except for some serious rust on the trunk floor, some on the frame, pan and fenders.

I got to work in my small, unheated garage attached to the house and by the Fourth of July last year it was ready to roll—so ready that it led the parade in our Edgebrook celebrations on the Fourth.

My daughter, Margie, is now using it at Indiana Uni-

versity. She's got her college convertible just as I had mine! Thanks for starting me on the project. It was a tough job, but I had more fun with it than anything I've tackled in years.

JACK SCHLEGEL
CHICAGO, IL

Great Projects—By Any Name

The description "shed" in your fabulous project *Multi-purpose Utility Shed* (page 60, Apr. '85) undervalues a building that houses my Honda Accord, tractor, mower, snowblower, small tiller and a few other pieces of equipment as well. I built mine last summer and refer to it more accurately as my "garage."

DAVID CUMMING
WARNER, NH

I've received a lot of compliments on my Backyard Barn which I modified to suit our needs. My wife enjoys gardening, and for my work I installed water and electricity and have an infrared gas portable heater that I use on chilly spring and fall days. The loft stores all of our seasonal furniture.

FRED J. PALMER SR.
BROADVIEW HTS., OH

Readers For Life

Thanks from the bottom of my wallet for your item, "Caddy Oilers Revised" about excessive oil consumption in the 4.1-liter V8 engine (*Car Clinic*, page 24, Aug. '86). I was burning 3½ quarts every 1000 miles and the Cadillac dealer said it was normal! I received no notice from Cadillac and was at wits' end until I saw your explanation about GM's robots not installing piston rings at the required offset. I contacted another dealer who also saw your article. He found that six of my eight pistons had the wrong setup and corrected it at no cost. I now use no oil whatsoever. I don't know how much you saved me, but I know it was a bundle! Once again, when one of my four boys asks, "Where'd you learn that, Dad?" The answer will be, "In PM." A subscriber for life.

RICHARD L. LANG
SWARTZ CREEK, MI

Little did I realize that I'm older than PM, which I now know is celebrating its 85th year (*Editor's Notes*, page 6, Apr. '87). July 17, '01 is my launch date, so I've been reading PM all its life, at least since I was old enough to look at my Dad's. When I left home I got my own subscription, and have been receiving and enjoying it ever since. How many other old faithfuls are out there, I wonder?

CHARLES E. HUOT
CORPUS CHRISTI, TX

Making Waves

Stop ignoring the sailors among your readers with miniscule coverage of sailboat technology! Your *Boating '87* section (page 90, Mar. '87) is full of fuel-hungry powerboats.

STAN BALICK
BALDWIN, NY

We know you feel becalmed, so we'll let you know that our boating editor just tested a handful of under 20-ft. sailboats for a future story.

And we hope you didn't miss *Sails & Science* (page 67, Feb. '87), our report on the America's Cup 12-meter sailboats.

I can't believe the QEII is getting a speed boost from 28 to 42½ knots by changing engines from steam to diesel during her refurbishing. (*PM Technology Update*, page 151, Apr. '87).

ALBERT W. BAILEY
ANCHORAGE, AK

Belay that! A stowaway dig-it boarded our floppy disc; the QEII will make 32½ knots.

Unkind Cut

When cutting a closed miter on a ceiling molding, turn the molding upside down in the miterbox, not as shown in illustration 16 on page 118 (*How To Install Trimwork*, page 115, Dec. '86). The molding may move and give a bad cut the way you show.

JAMES L. KITTLE
WARREN, MI

Your method is more controllable, but it would require the novice to make a difficult visualization to keep track of the proper orientation of the cut.

Our depiction is easier for the beginner to understand—and we did emphasize that the molding should be held firmly against the fence.

Also, the trim is soft pine so any miterbox should cut it successfully. When working with hardwoods, we agree that your technique would have an advantage.

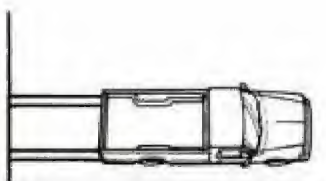
PM

Barn/Garden Shed in PM's Plans And Ideas catalog modified by reader Palmer. Plan PL-1278 is \$10.50. Reader Cumming's "Utility Shed" is PL-4-85; it's \$17.50: Popular Mechanics, P.O. Box 1014 Radio City Station, New York, NY 10101.



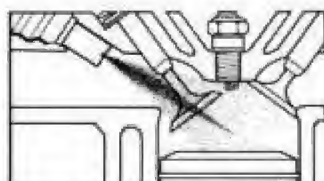
The new shape of tough: The '87 Ford pickup.

America's best-seller* gets even better!
Advanced aerodynamic design. Multiple-port fuel injection
for 20% more power standard. Luxury interiors.
Rear antilock brakes, first in any pickup.



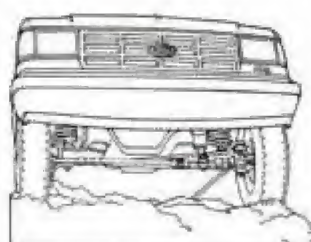
Rear antilock brakes standard.

Now, a major advance in braking control! All big '87 Ford pickups feature rear antilock brakes — designed to help you make straight, smooth stops. And they're standard equipment! These aerodynamic Fords not only *look* distinctive...they also change the way pickups stop, go, ride and drive.



Multiple-port fuel injection.

Now electronic injectors beef up Ford's 4.9L Six with 20% more horsepower — standard! V-8's range from the most powerful small V-8, the fuel-injected 5.0L... to the biggest gas and diesel engines in any pickup. You get up to 245 horsepower to move payloads big as 5450 lbs. Or to tow over twice that much.**



Fully adjustable Twin-I-Beam.

Ford front suspensions have been redesigned for truer tracking, longer tire life. They're also now fully adjustable. And for 1987, gas-pressurized shocks contribute to a ride that's smooth on the road yet firm in rough going. Try the ride of a full-size Ford — America's best-selling pickup for ten straight years.*



Luxurious cab interiors.

Inside, you enjoy a high level of comfort and luxury. Behind the sporty A-frame wheel is full instrumentation backed by a dozen labeled indicator lights — all standard.

6-Year/60,000-Mile Powertrain Warranty.

New Ford limited warranty covers powertrains for 6 years/60,000 miles and provides protection against body-panel rust-

through for 6 years/100,000 miles, whichever comes first. Restrictions and deductible apply. Ask to see a copy of this limited warranty at your Ford Dealer.

Buckle up — together we can save lives.

*Based on '86 calendar year manufacturers' reported retail deliveries.

**When properly equipped and with a fifth wheel.

Best-Built American Trucks six years running.

Based on an average of owner-reported problems in the first three months of service on '86 models, and in a six-month period on '81-'85 models designed and built in North America. At Ford, Quality is Job 1.



FORD PICKUP

BEST-BUILT AMERICAN TRUCKS





Imports

BY BILL HARTFORD



1988 Merkur Scorpio



Scorpio 5-door hatch has joined the XR4Ti at L-M Merkur dealers.

FoMoCo strikes again. The Scorpio just went on sale here and already it's a winner: It comes from Europe with the Car of the Year award for 1986, and over a dozen other honors. The German-built, Eurolux touring sedan is one of the few cars to offer the astounding versatility of a hatchback built into a 4-door sedan—all the while appearing to be a notchback. As owners of Saab's 9000 and Mazda's 626 5-door know, this configuration is unbeatable for practicality—and no sacrifice of performance or sportiness is required. The Scorpio has everything you'd want packed onto a single chassis. It's a mid-\$20,000, aerodynamic, 3-liter, fuel-injected, 144-hp V6-powered, antilock-

brakes-equipped rear-drive sedan that offers optional leather seats; power sunroof; 4-speed overdrive automatic transmission; touring package and long-legged comfort



Wraparound-type cockpit greets driver.

for five. On rough roads, 4-wheel i.s. and a soothing 7.7 in. of wheel travel keep the seat of your pants where it belongs. At 3240 pounds, the Scorpio's a solid setup. We've already got staff miles on this one and we'll be logging more.



Scorpio measures up big: Wheelbase is 108.7 in., length, 186.4 in. Cargo volume with seatbacks down, 37.2 cu.ft. and fuel 16.9 gallons.

Way-Out

The Monster is just the vehicle for muscling through snow-bound mountain passes. It may be Franco Sbarro's wildest creation to date. Recently shown at the Geneva Auto Show, the Monster joins a long list of specialty machines from the Swiss auto manufacturer. His one-offs are imaginative flights of fancy, like the Mercedes-Benz 500 SEC that was fitted with gull-wing doors. The company's staples, though, are replicas of classics, like BMW's old 328 roadster.



Sbarro's Monster, perfect for off-road warriors, packs a small 2-wheeler in the back.

Supercoupe

At a time when the average price of an automobile going out the showroom door is a good \$12,000, for a car that may very well be the lowest priced in an automaker's

161 horses worth from its 2.7-liter, 24-valve, sohc, V6. And the stop is sure, swift and steerable with antilock braking. There are three versions: base, L and LS. The L and LS, in addition to ALB, get features like leather seats, computer center, automatic climate control and antitheft system. On top of that, the LS has driver's-side airbag and BOSE sound system. Other than



New Acura Legend has all the right stuff.

model range—like a Honda Civic—it's no wonder that all the good stuff is \$20,000 or more. The Honda Acura Division's new Legend Coupe is an example of that good stuff. It's in the "personal luxury" class, which means no back doors for back-seat drivers. It's the front-seat driver's car from stop to go. The go is

those extras, there's nothing base about the basic Legend Coupe. It has all the essentials from the ground up: 4-wheel disc brakes to power-operated sunroof—and all the same drivetrain and chassis hardware as the upscale versions. Choose it, and you can keep the price closer to \$20,000.

Open BMW

The 325i convert wasn't here in time for our open-air test (*Ragtop Fever*, p. 71, June '87), but it's here now in all its glory and impeccable workmanship. If it had been in our comparison, the new BMW would have been the most expensive: \$28,875 base price. A winter hardtop is \$2495. Other specs: Engine is 168-hp, sohc, 2.5-liter inline Six; transmission, 5-speed or auto; wheelbase, 101.2 in.;



BMW 325i's folded top is covered with a rigid plastic boot.

length, 175.6 in.; weight, 3015 pounds and EPA mileage, 18 city/23 highway, with either transmission. **PM**

**We not only give you the money for college.
We also give you the time.**

If you think the best way to pay for college is to put it off for a few years and join the military, you're half right.

Because with the New GI Bill, you can join the Army National Guard and get a guaranteed minimum of \$18,000 for college.

But best of all, you serve two days a month and two weeks a year. Which means you can go to school full-time. Right now. On us.

So the question you have to ask yourself is not, can you afford college.

The question is, can you afford to wait.

For more information about the Army Guard and the New GI Bill, fill out the attached coupon and mail it in. Or call **800-638-7600***

*In Hawaii: 737-5255; Puerto Rico: 721-4550; Guam: 477-9957; Virgin Islands (St. Croix): 773-6438; New Jersey: 800-452-5794. In Alaska consult your local phone directory.

MAIL TO: **Army National Guard**, P.O. Box 6000, Clifton, NJ 07015

NAME ☐ M ☐ F

ADDRESS

CITY/STATE/ZIP

AREA CODE PHONE US CITIZEN ☐ YES ☐ NO

SOCIAL SECURITY NUMBER BIRTH DATE

OCCUPATION

STUDENT ☐ HIGH SCHOOL ☐ COLLEGE
PRIOR MILITARY SERVICE ☐ YES ☐ NO

BRANCH RANK AFM/MOS

The information you will enter is required, including your social security number. We will use it to verify your eligibility for the GI Bill. Your social security number will be used to verify your eligibility for the GI Bill. Please see the back of the coupon for more information.



National Guard
AIPMMC*077PS

©1990 UNITED STATES GOVERNMENT AS REPRESENTED BY THE SECRETARY OF DEFENSE. ALL RIGHTS RESERVED.

Army National Guard
Americans At Their Best.

Minimum: 17 years old, U.S. citizen or permanent resident, high school graduate or GED, no prior felony convictions.

Outdoors



BY JOE SKORUPA

Jet Ski's Big Brother



Kawasaki's JS650 sets new pace among beach bombers.

Possessing the kind of roll-on power you'd normally associate with upstart café racers and top-of-the-line snowmobiles, Kawasaki's new Jet Ski 650 is destined for greatness in the expanding personal watercraft market. Recently, we had a chance to take Kawasaki's latest water toy for a spin along Florida's Gulf Coast, and we found some profound differences between the 650 and her smaller-displacement older siblings.

Start with the thumb throttle. In addition to the instantaneous response it offers from the 635-cc liquid-cooled 2-stroke under the engine cowl, it's also been repositioned slightly for easier operation. Complete freedom of maneuverability is now possible, and all that muscle in reserve can be used to power out of the tight spots. That's 25 percent more power with a mere 30-pound increase in weight. A slightly redefined bottom shape also helps create an almost effortless cruising experience.

The 650 has a sleek molded profile, and Kawasaki has wisely repositioned the exhaust outlet behind the driver. That eliminates the snootful of CO that normally accompanies startup on some older models.

Other features of this 282-pound unit include oil injection, electric start, remote choke and fuel reserve.

Kawasaki's new beach bomber will help rewrite some rules. It's easier to train on, easier to drive for the already-initiated, and, for you experts, it has enough top-end speed to pin your ears back.

Jet Skis have always been marketed for the young and agile, but the 650 is so smooth and docile that older neophytes will no doubt take to it easily.

Only one complaint: The side rails are a little too narrow to comfortably rest your elbows on during startup. For more information, contact Kawasaki USA, 9950 Jeronimo Rd., Irvine, CA, 92718; (714)770-0400.

Aerodynamic Air

How do most motor-roamers spell summer-heat relief? Until recently, it was spelled like one of several models of Coleman RV air conditioners, starting with the Polar-Pal introduced in 1967.

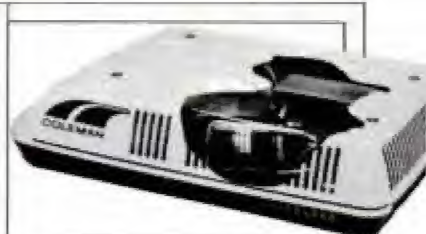
But now it's being spelled Super-Mach, thanks to a new aerodynamic unit that is a significant advancement over previous models. The Super-Mach is small and sleek, only 9½ in. high, yet it has a 13,500 BTU cooling capacity.

The design features a horizontal compressor, dual blowers and a wraparound coil, allowing it to fit into an ultralow shroud for better aerodynamic performance.

How will RV owners spell relief next year? Coleman is currently developing a new unit with an electronic thermostat control that automatically adjusts fan speed to maintain a constant temperature. It's scheduled to go into production by the end of the year. For more information, contact the Coleman Co., Recreational Vehicle Div., PO Box 1762, Wichita, KS, 67201; (316)261-3348.

New Sport Designs Afoot

Need a pair of shoes with razor-sharp needle spikes? How about ones with hard-gripping suction cups? If these aren't for you, that's because they're custom-de-



Super-Mach chills RV air with new low-profile configuration.

signed by Adidas for bobsleders and boardsailors.

But there are about 75 other designs in Adidas's new specialty shoe line, each with its own sport-specific features. And one will fit both you and your favorite recreational pastime.

Firm footing is the bare-foot boardsailor's biggest worry, so suction cups are a step in the right direction. But the Windsurfer Super II offers more than a hard-gripping sole. Its high-top boot design supports extreme positions achieved when pulling against a fiesty wind. The ankle collar is angled away from the Achilles' tendon for freedom of movement, while lateral ball and rear heel straps anchor the foot inside the shoe. Upper is made of water-repellant nylon with synthetic suede.

For soft landings, Adidas makes a high-top Parachuting shoe that has a full-length midsole padded with resilient EVA (Ethyl Vinyl Acetate).

It has a uniform thickness

(Please turn to page 14)



Windsurfing



Parachuting



Bobsled



Motorcycling

Adidas's new specialty shoes offer sport-specific design features.

THE BEST GENERATORS ARE POWERFUL, RELIABLE AND QUIET. THAT'S WHY THEY'RE CALLED HONDAS.

Currently, Honda generators are the most widely-used, widely-trusted generators in the world.

Which should come as no surprise.

Especially when you consider that most Hondas are built around fuel-efficient, trouble-free Overhead Valve engines inspired by decades of world-class automobiles and motorcycles.

Or that Honda has the world's broadest range of multi-purpose generators from 650 to 6500 watts. For camping, boating, construction uses, power outages, outdoor parties, recharging car batteries—or most electrical needs at home or away-from-home.

Still, the real difference between an ordinary generator and a Honda generator can most accurately be summed up in one word: reliability.

The power you need is there when you need it. Because we engineer every single generator to ensure easy starts, quiet operation and durability that's measured in years—not months.

Honda generators. Quite simply the finest machines your money can buy. A claim no one else has the power to make.

HONDA

Power

Equipment

IT'S A HONDA



For optimum performance and safety, we recommend you read the owner's manual before operating your Honda Power Equipment. Connection to house power requires transfer device to avoid possible injury to power company personnel. Consult a qualified electrician. © 1986 American Honda Motor Co., Inc.

Attack the paint. Defend the wood.

Removing layers of paint from wood is difficult. Removing the paint *without harming the wood* may be one of the world's *toughest* tasks.

Homer Formby has the solution: Formby's® Wood Formula Paint Remover.

Independent tests show Formby's Wood

Formula Paint Remover is better at removing layers of paint than the most commonly used brands. And it won't raise wood grain or discolor the wood.

Formby's Wood Formula Paint Remover is the one to use on wood. Homer has done it again.



PAINT REMOVER

© 1987 Thompson & Formby Inc.

OUTDOORS

(Continued from page 12)

of 8 mm, except for the heel, where it widens to 10 mm. Additional shock-absorption is provided by a deep saw-tooth cut into the rubber outsole, which also propels landing skydiver forward.

Nothing beats a hard-nylon plate imbedded with razor-sharp needle spikes for traction on ice. This is the essential feature of the Bobsled Sprint shoe. The spikes are anatomically positioned to give traction to weight-bearing portions of the foot. For heel support, it features an EVA midsole shaped like a wedge that tapers to zero at the spike plate.

Tony Mang, the name of a motorcyclist and now a new performance shoe, has an outsole made of a gasoline-and-oil-resistant rubber compound, which prevents slipping when shifting gears. It also features a specially padded and reinforced toe box for bruise protection. A Velcro tongue covers the lacing system to keep out dirt and water.

For more information, contact Adidas, 200 Sheffield St., Suite 300, Mountainside, NJ, 07092; (201)789-9292.

Sharp Solution

For light wilderness duty nothing beats the versatility of a Swiss Army knife, but what do you do when you need to chop firewood, dress game or clean large fish? The answer is the Solution.

The Solution is a new knife/ax combo tool made by Alcas Cutlery. It has a 5-in., razor-sharp blade and a 3½-in. curved ax head. Move the swing-away handle to one side, it's a knife; move to the reverse, it's an ax. The handle locks in either position.

The Solution is 12½ in. long and weighs 1 pound, 9 ounces. The knife and ax blades are made of high-carbon 1095 tool steel. While the handle is glass-reinforced Zytel nylon.

Designer Dan Harrison didn't stop with knife and hatchet functions. He added a 3-in. alternating double-toothed saw and a ⅝-in.-radius game hook on the back of the knife blade. It also has a 4-in. watertight storage tube. Retail price for the Solution is about \$165. For more information, contact Alcas Cutlery, 116 E. State St., Olean, NY 14760; (716)372-3111.

PM



The Solution knife/ax system shown in transition between lockable function modes.

Astounding stories

Monumental misunderstandings
in car care



Some car owners don't realize a radiator cap is more than just a plug—it's a vital part of the cooling system. Don't let an interior or worn-out cap turn your next trip into an overheated nightmare. Test your cap before the summer driving season begins. If necessary, replace it with one of the quality radiator caps from Stant. For testing information, write for our new Cooling System Fact Book. For help in selecting the proper Stant cap for your car or truck, see a Stant retailer near you.



Stant®

Stant Inc.
1620 Columbia Avenue
Connersville, Indiana 47331-9990
A Purolator Company

The most famous knife in American history.

JIM BOWIE'S KNIFE

First authorized replica of the blade carried by the great Western hero at the Alamo.



They called it "the Arkansas toothpick." It became an American heirloom. The very knife which the courageous patriot Jim Bowie carried at the Alamo in 1836.

Now you can own an *authentic re-creation* of that famous knife. Issued by The Franklin Mint to mark the 150th anniversary of the Battle of the Alamo.

Re-created with original markings

Every detail of the knife is accurate. The long blade, forged from a single piece of stainless steel. The hand-cut serrations. The cross-guard. The hand-carved oak grip. The pommel and ring. All of these elements—perfectly hand-fitted.

And the *unique markings* are replicated too. The

Shown smaller than actual length of 13 1/2."

name "J. BOWIE" on the front. The initials "JB" and acorn symbol on the underside, identifying the maker.

The knife will be sent along with a fascinating commentary on Jim Bowie—and a Certificate of Authenticity.

Hardwood display case included

You can display The Jim Bowie Knife in your home or office. It will be safely protected in a hardwood case, with lock and key. The price is \$295, payable in convenient monthly installments.

To acquire this imported re-creation of a priceless relic of American history, please mail your order by July 31, 1987.



ORDER FORM

The Franklin Mint
Franklin Center, Pennsylvania 19091

Please enter my order for The Jim Bowie Knife, to be handcrafted individually for me. I need send no money now. Bill me in five equal monthly installments of \$59.* each, beginning when the knife is ready to be sent. A hardwood display case with lock and key will be provided at no added charge.

*Plus my state sales tax and a total of \$3. for shipping and handling.

Please mail by July 31, 1987.
Limit of one per person.

Mr./Mrs./Miss _____

PLEASE PRINT CLEARLY

Address _____

City _____

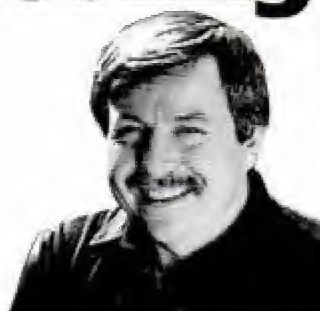
State, Zip _____

Signature _____

ALL ORDERS ARE SUBJECT TO ACCEPTANCE

Freewheeling

BY WADE HOYT



Fastest U.S. Car?



Aerodynamic Pulse GCRV has tandem seating for two, training wheels in the little winglets, and a Honda motorcycle drivetrain.

Vette fans! Throw away your fiberglass dinosaurs and get into the '87 Pulse GCRV, said to be "faster than any production car built in America." Powered by an 86-hp, 1.2-liter Honda Gold Wing engine, the Pulse has a 0-to-60 time of 6 sec-

onds and a calculated top speed of 180 mph. Weight is 1080 pounds and "unofficial wind tunnel tests" give it a C_D of "0.18 clean; 0.19 dirty." It costs about \$15,000 from Owosso Motor Car Co., 501 S. Chestnut St., Owosso, MI 48867.

Bag It

Ford safety experts point out that a 3-point lap/shoulder belt is still the best way to ride out an accident. In a head-on collision, 40 to 50 percent of serious injuries can be prevented by a 3-point belt; 35 to 50 percent with a passive (shoulder only) belt; 20 to 40 percent by an air bag alone; 40 to 50 percent by an air bag and lap belt combo; and 45 to 55 percent by an air bag used together with a 3-point belt.

The smart move is to always use a full 3-point harness, even if the car has air bags or a passive shoulder belt that automatically wraps

around you. Air bags help reduce head, chest and facial injuries, but only belts protect from rollovers, side impacts and rear-end collisions.

Although Ford has 11,000 air bag cars in the field, only 749 retail customers paid \$815 for the setup. The rest are in government and fleet sales. So far, there have been 91 deployments and no inadvertent pops.

Those dubious about air bags may not be comforted to hear that Morton Thiokol—the company that made the space shuttle's infamous O-rings—is in the field. Thiokol will build bag modules for Chrysler in 1988, and has

been making explosive gas generators for Mercedes.

Faded Glory

Ask any successful yuppie which luxury car he lusts after and you're almost certain to hear the name of an expensive European import, probably German or Swedish. Cadillac, Chrysler and Lincoln seem to be forgotten names among the rich and pretentious. Why?

At one time, American carmakers built vehicles that were competitive with the best Europe offered. Paradoxically, they were made during the Great Depression. While luxury carmakers like Auburn and Duesenberg were withering away, others thrived by supplying ostentatious transportation to a still-rich clientele that saw no reason to hide its wealth.

Luxury carmakers who survived The Great Crash did so by offering the highest technology then available. Few cars produced in Europe could outshine the 1930-'40 Cadillac V16s or the 1932-'35 Lincoln V12s (see photos below). Many sported custom bodywork by such great American coachbuilders as LeBaron, Fleetwood, Fisher, Waterhouse, Rollston, Brunn, Derham, Brewster, Dietrich, Murphy, Willoughby or Judkins—all gone now, save for the occasional nostalgic use of an old name.

World War II turned Detroit's attention from cars to tanks and aircraft. During the postwar boom years, Detroit took a more democratic turn, mass producing luxury cars in the hundreds of thousands for the emerging class of *nouveau riche* entrepreneurs and executives. Throughout the '50s and '60s, they symbolized wealth, quality and the fact that their owners had made it. These buyers did not demand leading-edge technology, only big, comfortable cars with prestigious nameplates.

Two energy crises and more sophisticated tastes among the affluent have changed all that. Lincoln's square-rigged Town Car, while still popular, is no longer at the leading edge of technology or sophistication. And the Mark VII, though sleek and fast, is little more than an optioned-up T-Bird.

Cadillac and Chrysler's expensive new Allante and Maserati 2-seaters are an attempt to reenter the ultraluxury market and attract a more youthful and sophisticated clientele. Ford's attempt to do the same thing by selling high-tech European models under the Merkur nameplate has been less than a roaring success. It remains to be seen whether chopped Seattles and LeBarons with fancy European names and megabuck sticker prices will be any more successful. **PM**



This 1930 Cadillac formal 7-passenger limousine featured an exotic 16-cylinder engine and absolutely oozed world-class sophistication.



1932 Lincoln KB roadster with V12 and rumble seat was the apex of conspicuous consumption and leading-edge technology in its day.



**INTRODUCING A
WHOLE NEW ANIMAL.
A LEANER, MEANER
FULL-SIZE 1988
CHEVY PICKUP.**

ANIMAL



ROCKBONE



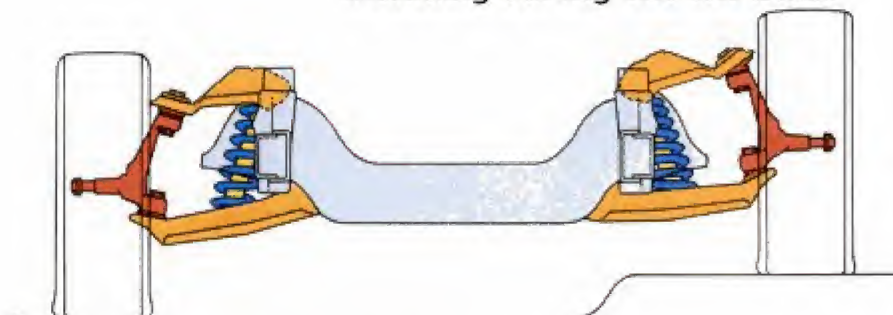
New rear suspension
with longer leaf springs
that adjust automati-
cally to load for a
smooth ride.

© 2000 Ford Motor Company. All rights reserved. Ford, the Ford logo, and Rockbone are trademarks of Ford Motor Company.

The new 1988 Full-Size Chevy Pickup. V

1 The front suspension. There are actually two: one designed specifically for two-wheel drive, the other specifically for four-wheel drive.

Both are fully independent, which means both are designed to give you a smooth ride. In fact, out on the highway, our 4x4 rides so smoothly you tend to forget it's also a tough, rugged off-road animal. And that should give you an idea of how smoothly our 2WD trucks ride, including our big one-ton truck.



2 The rear suspension. Our new rear springs are longer than on some other pickups. (To understand the advantage, hold your thumb and fingers together and try to balance a ruler on top of them. Now extend the distance between your thumb and fingers. See how much more stable the ruler rests on top of them?)

The rear leaf springs are also engineered to adjust to load weight, to give you a smooth ride empty or loaded.

3 The ground clearance. See how the front suspension's tucked up within the frame instead of hanging down below it? That gives you the high ground clearance you want. Yet you don't have to step up high to get in the truck.

ART



New-design fuel tank mounted inside the frame rails.

Highest highway gas mileage of any full-size pickup.* EPA est. 23 highway MPG.

*Excludes other GM products.

New rear suspension with longer leaf springs that adjust automatically to load for a smooth ride.

©1994 GM Corp. Buckle up, America! Buckle up, America!



12 The visibility. We've added over a thousand square inches of glass. Plus a new wiper system to make the most of it all. And notice how much of the road ahead you see over the new, aerodynamically sloping hood.

13 The new instrument panel. You see the Silverado here,

16 The room. It's what you buy a full-size pickup to get. And the new 1988 Chevy has more cab room than Ford or Dodge. In fact, the new Chevy has the longest cab of any full-size pickup*.

17 The finish. That smooth, deep, wet-look finish is going to stay looking that new and that good for a long time. Because it's topped by a new clear coat that helps seal and protect the finish.

18 The interior. It's more complete than you might expect.

Even our least expensive model gives you a full-size glove box with lockable door, sun visors, armrests, power steering and brakes and a whole lot more. To give you a whole lot more truck for your money.


19 The corrosion protection. There's more of it in more places than any full-size Chevy before—as many as seven layers in critical areas. And that's on a truck with exterior body panels built almost entirely of two-sided galvanized steel.

with gage package and other optional equipment. New 4-spoke wheel; clean, clear, easy-to-read information, all easily at hand. A reminder of just how new your new Chevy is. Every time you take the wheel.

14 The doors. Notice how easy our new pickup is to get in and out of. That's because the doors are wider and the cab floor's lower than on our past pickups.

15 The cargo box. It's a new all-welded design with no exposed bolt heads to trap water and cause rust. The tailgate's removable. And special indentations in the sides of the box let you build a platform of 2x6s across the top of the wheelhousings to haul double-tier loads.



A red Chevrolet pickup truck is shown from a side-rear perspective. In the background, a large, brown bear's head is visible, roaring with its mouth open, showing sharp teeth. The truck is parked on a dark, rocky surface. The text is overlaid on the image in white boxes.

Heaviest standard payload rating of any 1/2-ton pickup.*

More visibility front, back and sides than our previous pickup. Plus an aerodynamically sloping hood to let you clearly see the road ahead.

New flush-mounted glass reduces wind noise. To give you a quieter truck inside.

Two-tier loading. Cargo-box side indentations let you build a platform of 2x6s across the top of wheelhousings.

New-design fuel tank mounted inside the frame rails.

Highest highway gas mileage of any full-size pickup.* EPA est. 23 highway MPG.

***Excludes other GM products.**

New rear suspension with longer leaf springs that adjust automatically to load for a smooth ride.

Two-sided galvanized steel protection on all exterior body panels except the cab roof.

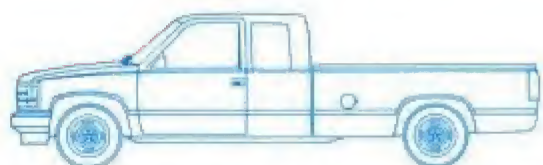
Anti-chip protection against stones and gravel covers all lower body side panels.

THE WHO

A full-size pickup built new from the inside out. To give you remarkable handling, excellent ride and quietness. While working harder than any big pickup before.

24 **The new Cheyenne.** A new base truck ready to work for you. Complete with chrome bumper, rubber mats, glove box, armrests, sun visors, power brakes, power steering and more.

25 **The new Scottsdale.** A noticeable step up inside and out. Open it up, look it over, drive it and you may decide it's all the full-size pickup you need.

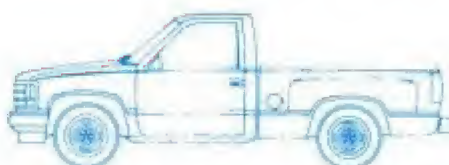


26 **The new Silverado.** The ultimate 1988 Full-Size Chevy Pickup. Deluxe quad headlamp front end, deluxe side and rear treatment. And inside is everything you expect a Chevy Silverado to be. Plus a lot more.

27 **The new Extended Cab.** Introducing the roomiest of all extended cabs*. So roomy, six adults can sit comfortably facing forward. The available full-width rear seat flips down, the cargo box is a full 8 feet.

28 **The new Sportside.** It's coming this fall and a sweeter, smoother short-box you've never seen. Drop in the available 350 V8, dress up the wheels and you've got a street truck ready to light up your life. Guaranteed.

*Excludes other GM products.



Folded edge of the page



Foldout slip-sheet

1. Open the foldout page
2. Insert this sheet with
1. Front side touching the free page
2. Arrow pointing to the fold
3. Slice the folded edge
4. Close the page and slip-sheet



1. Open the foldout page
2. Insert this sheet with
 1. Front side touching the free page
 2. Arrow pointing to the fold
3. Slice the folded edge
4. Close the page and slip-sheet



1. Follow instructions on the other side

Back

GBS11Back-001B




Inverted Back

1. Follow instructions on the other side

THE BACK

A pickup built new from the inside out. With a bigger, heavier, more massive new frame. Plus advanced new front and rear suspension, new rear-wheel anti-lock brake system. For new levels of ride and braking control in a full-size pickup.



Massive boxed channels up front for added strength under the engine.

New fully independent front suspension on both 2WD and 4WD.

Standard power brakes. Big discs up front, massive drums in rear.

Standard rear-wheel anti-lock brake system for stable, smooth stops empty or loaded, on slick or dry pavement. System operates in 2WD only.

What makes it a better pickup for you.

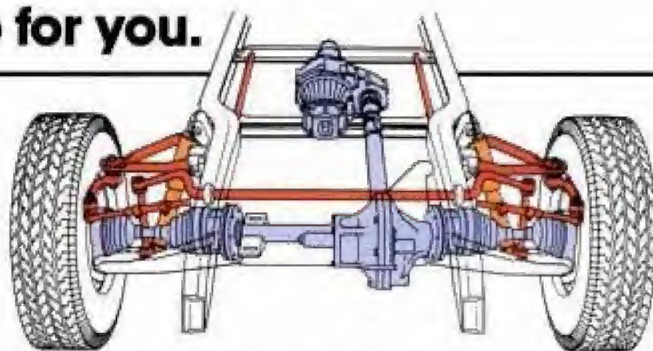
4 The new frame. With its massive boxed channels under the engine, it's one of the heaviest frames ever put under a Chevy pickup. The result is a degree of stability we think you'll notice when you test drive our new 1988 Full-Size Pickup. Which we invite you to do at your earliest opportunity. And feel how impressive a pickup can be when it's engineered new from the inside out—the first all-new full-size pickup in eight years.

5 The cab-to-box alignment. The back of the cab and front of the cargo box are both mounted on a single, one-piece bracket for a more even fit. An example of the quality fit and finish you'll see throughout our new pickup.

6 The standard engine. It's a modern, high-compression Vortec V6 that gives you 15 more standard horsepower than Ford's half-ton pickup, 60 more than Dodge. Combined with our new standard 4- or 5-speed manual transmissions, you're likely to find it's all the engine you need for just about everything you do. And that includes pulling a good-sized trailer.

7 The new 4- and 5-speed manual transmissions. They're a new design built to world-class quality standards. And you'll feel it with every smooth, short, easy shift you make.

8 The brakes. The rear brakes are connected to a computer that modulates rear brake line pressure. This controls rear-wheel lockup to give you directional stability under heavy braking.



9 The Insta-Trac. It's a 4x4 advantage Ford doesn't give you. And we're the *only* full-size 4x4 with both Insta-Trac and independent front suspension*.

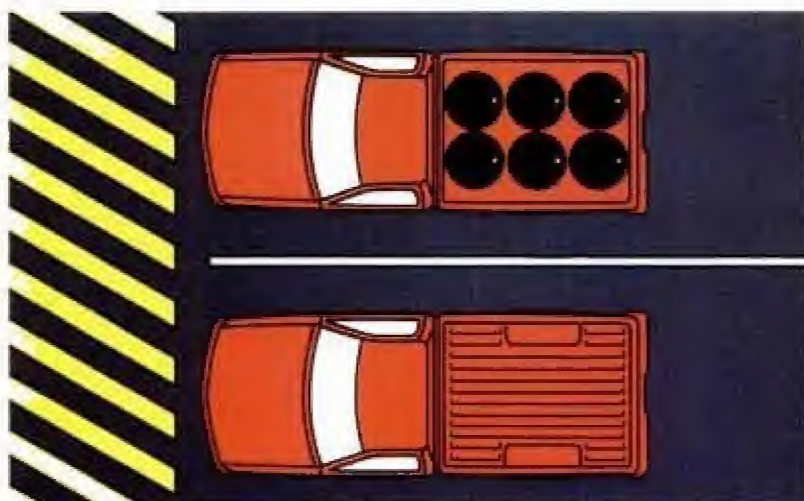
10 The clean thinking under the hood. Notice the working room around the engine. And how clean and uncluttered our fuel-injected engines are compared to Ford and Dodge pickups.

Notice, too, the new single serpentine belt that replaces the three or four belts you see on older engines. It's designed to last. And even comes with built-in tension adjustment.

And don't look for the jack under the hood. We've moved it inside the cab. And given you a convenient scissors-type jack.


11 The tires. We've made premium all-season steel-belted radials standard on all models. And big 16-inch tires standard on all 4x4s.

*Excludes other GM products.



THE HEA

**It builds with fuel-injected power:
The most standard power,
the most available V8 power
in half-ton pickups. Plus
standard shift-on-the-fly
Insta-Trac on 4WD
pickups.**



Massive boxed channels up front for added strength under the engine.

New 4- and 5-speed manuals feature short, easy shifts. Five-speed manual standard on $\frac{1}{2}$ - and $\frac{3}{4}$ -ton 4WD and $\frac{1}{2}$ -ton 2WD.

New fully independent front suspension on both 2WD and 4WD.

Most V8 power and torque available in pickups under 8,500 lbs. GVWR: the fuel-injected 350 V8 available in all models.

Most standard power in $\frac{1}{2}$ -ton pickups: the 160-HP, fuel-injected Vortec V6.

Standard power brakes. Big discs up front, massive drums in rear.

Standard Insta-Trac shift-on-the-fly on all 4WD models. Small trucks have it. Now you can have it on a big Chevy Pickup. And as standard equipment.

Standard rear-wheel anti-lock brake system for stable, smooth stops empty or loaded, on slick or dry pavement. System operates in 2WD only.



- 20** **The driving position.** The seat-back's more reclined than in other pickups, the steering wheel's at a more comfortable angle. And when you order the Custom Cloth option in the Silverado, you get a totally new kind of contoured seat for even more support, even more long-distance-driving comfort.

- 21** **The grille.** It's a new one-piece design. To make it easier for you to replace should the need ever arise.

- 22** **The quiet.** It comes from the aerodynamics of the smooth, rounded shape, the flush-mounted glass, the tight window and door sealing, the hidden drip moldings, the insulation. A level of quietness to help see you through a full day. And feel less tired at the end of it.

- 23** **The options.** There's more than ever before. New bucket seats, for example. Delco/Bilstein front shocks in the available 4WD off-road package. New sound systems that rival those available in the most expensive cars. And an advanced new air conditioning system.

*Excludes other GM products.



THE HIDE

It continues with strong, two-sided galvanized steel. A body shaped to give you more room, more comfort, more quiet. Backed by the heaviest standard payload of any half-ton pickup.*

More shoulder room than Ford or Dodge.

More total cab room than Ford or Dodge.

High-pressure Delco/Bilstein front shocks included on available 4WD off-road package.

Massive boxed channels up front for added strength under the engine.

New 4- and 5-speed manuals feature short, easy shifts. Five-speed manual standard on 1/2- and 3/4-ton 4WD and 3/4-ton 2WD.

New fully independent front suspension on both 2WD and 4WD.

Most V8 power and torque available in pickups under 8,500 lbs. GVWR: the fuel-injected 350 V8 available in all models.

Most standard power in 1/2-ton pickups: the 160-HP, fuel-injected Vortec V6.

Standard power brakes. Big discs up front, massive drums in rear.

Standard Insta-Trac shift-on-the-fly on all 4WD models. Small trucks have it. Now you can have it on a big pickup. And as standard equipment.

Standard rear-wheel anti-lock brake system for stable, smooth stops empty or loaded, on slick or dry pavement. System operates in 2WD only.



OLE NEW





SERIES		MAXIMUM GVWR ^o (lbs.)	MAXIMUM PAYLOAD [*] (lbs.)	MAXIMUM GCWR [†] (lbs.)	FUEL-INJECTED GASOLINE ENGINES					DIESEL MODELS		TRANSMISSIONS				
					4.3L V6 262 Cu. In.	5.0L V8 305 Cu. In.	5.7L V8 350 Cu. In.	H.D. 5.7L V8 350 Cu. In.	7.4L V8 454 Cu. In.	6.2L V8 379 Cu. In.	H.D. 6.2L V8 379 Cu. In.	4-SPD. MANUAL	4-SPD.** MANUAL	5-SPD. MANUAL	3-SPD. AUTO.	4-SPD. AUTO.
1500 (½-ton) 2WD-SWB		5200-5600	1639-1918	12,000	STD	OPT	OPT					STD	OPT	OPT	OPT	OPT
	-LWB	5200-5600	1464-1644	12,000	STD	OPT	OPT					STD	OPT	OPT	OPT	OPT
4x4-SWB		5600	1504	12,000	STD	OPT	OPT						OPT	STD	OPT	OPT
	-LWB	5600	1422	12,000	STD	OPT	OPT						OPT	STD	OPT	OPT
2500 (¾-ton)	2WD	7200	3267	13,500	STD	OPT	OPT			STD			OPT	STD	OPT	OPT
	4x4	7200	2916	13,500	STD	OPT	OPT			STD			OPT	STD	OPT	OPT
3500 (one-ton)	2WD	8600-10,000	4176-5157	19,000				STD	OPT		STD		STD		OPT	
	4x4	8600	3817	16,000				STD	OPT		STD		STD		OPT	
1500 Extended Cab	2WD	6000	1925	12,000	STD	OPT	OPT					STD	OPT	OPT	OPT	OPT
	4x4	6200	1680	12,000	STD	OPT	OPT						OPT	STD	OPT	OPT
2500 Extended Cab	2WD	7200	2977	13,500	STD	OPT	OPT			STD			OPT	STD	OPT	OPT
	4x4	7200	2621	12,000	STD	OPT	OPT			STD			OPT	STD	OPT	OPT
3500 Extended Cab	2WD	8600-10,000	3907-4927	19,000				STD	OPT		STD		STD		OPT	
	4x4	8600	3538	16,000				STD	OPT		STD		STD		OPT	

^oGVWR — Gross Vehicle Weight Rating includes truck, passengers, cargo and equipment.

^{*}Payload with standard angles includes passengers, equipment and cargo.

[†]GCWR — Gross Combination Weight Rating includes truck, trailer, passengers, cargo and equipment.

**With low-ratio first gear. STD — Standard OPT — Optional

Let's get it
together...
buckle up.



See your Chevrolet dealer for terms and conditions of the new limited powertrain warranty.

THE
Heartbeat
OF AMERICA

TODAY'S
CHEVY TRUCKS

Workshop Minicourse

BY ROSARIO
CAPOTOSTO



A miterbox guides a fine-tooth backsaw for cutting accurate 90° square and 45° miter cuts. The saw slides in guide-slots cut in the box sides. Hold work securely to prevent shifting.

Making A Miterbox

A miterbox and backsaw are essential for cutting trimwork, picture frames and other small-dimension stock accurately. A wide variety of store-bought miterboxes are available at hardware stores, home centers and through mail-order tool firms. Prices range from \$12 to more than \$300. However, you can make your own miterbox; simply follow the plans shown here.

Make the box from three pieces of maple, birch or beech. Use 3/4-in. stock for the sides and 4/4 for the bottom. Join the parts with glue and 1 1/2-in. No. 8 screws. The box shown allows you to cut 90° square and 45° left and right. If desired, you can cut additional saw guide-slots for other angles such as 22 1/2° and 30°. Also, the box dimensions given can be altered, if desired, but note that the inside depth of the box must be 1/8 in. less than the saw blade height as measured from the teeth to the bottom edge of the saw's spine.

The accuracy of the miter box depends entirely on how accurately you cut the guide-slots. Don't try to cut the slots freehand. Instead, clamp wood blocks to the box, as shown, to guide the saw and ensure perpendicular, accurate cuts.

When using the miterbox, clamp its overhanging bottom edge in a vise. Hold the work firmly in the box and start cutting by making a few light backstrokes. This will help to establish a starting kerf for the saw.

PM



Glue and screw together the box. Then, use a combination square to mark cutting lines on the top edge of the sides. Mark 90° and 45° lines.



Clamp wood blocks to the box to guide the saw and hold it on the cutting lines. While sawing, the saw's spine should be against blocks.

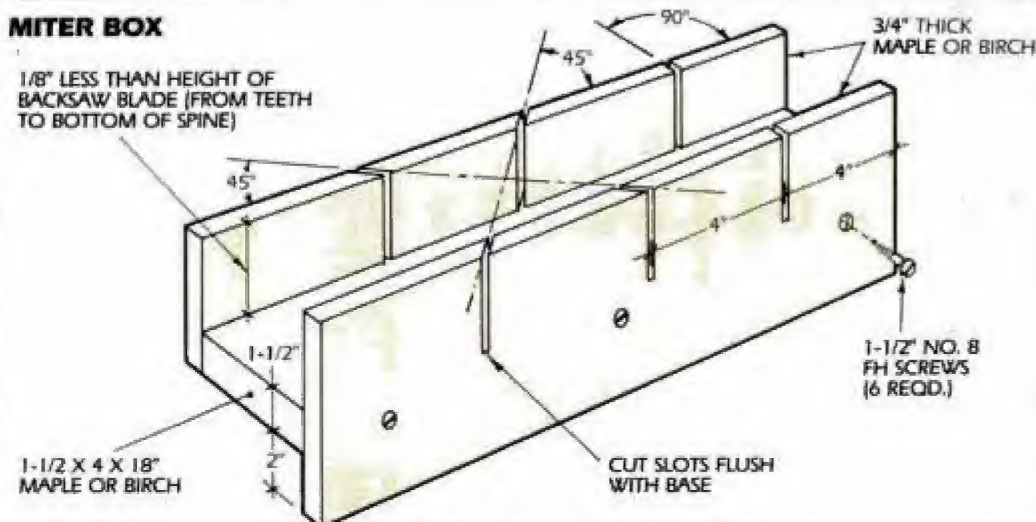


When cutting crown molding, insert a spacer strip to prop it up at the correct angle. Make a 45° cut to produce a compound-angle cut.



Clamp a wood strip to the saw blade to act as a depth-stop. Here, it's used to cut halfway through the stock to produce a half-lap joint.

MITER BOX



Real Dreams.

**Real people
want real taste.
Winston**

SURGEON GENERAL'S WARNING: Cigarette
Smoke Contains Carbon Monoxide.

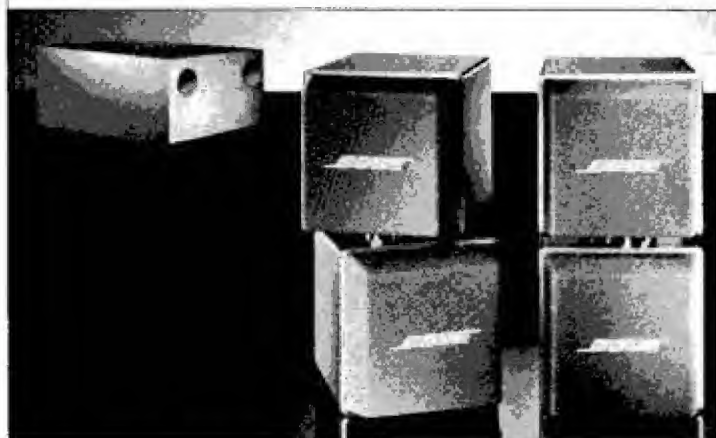


Audio



BY FRANK VIZARD

Heard But Not Seen



Acoustimass speaker system uses hideaway bass module (left).

If the floorspace often required by speakers upsets you, then Bose has the answer to your problem.

The company's AM-5 Acoustimass Speaker System might be the most invisible speakers ever offered. The AM-5 "system" is actually comprised of three individual pieces. The key element, though, is a bass-producing module weighing about 20 pounds and measuring $8 \times 12 \times 20$ in.

Inside this module are two 6-in., low-frequency drivers that fire into two internal chambers. The front of each driver cone sends sound into a ported chamber tuned to 90 Hz. The back of each cone fires into a second ported chamber tuned to 45 Hz. Both port openings are located on one of the smaller ends of the module.

The low-frequency energy generated within these chambers is then released into the room. This procedure differs

from conventional loudspeakers, which rely exclusively on movement of the driver cone to produce low bass frequencies. An added benefit, reports Bose, is reduced cone motion and reduced harmonic distortion.

The bass module can be placed anywhere in the room (at the demonstration I attended, the module was placed behind a sofa) because bass is omnidirectional.

Accompanying the bass module is a pair of 2-cube speakers, each set having one cube mounted on top of the other. Each set of cubes is smaller than a 1-quart milk carton and weighs about as much as a standard desk telephone. Inside each cube is a $2\frac{1}{2}$ -in. driver. The cubes radiate most of the treble and midrange sound since the crossover frequency to the bass module is 150 Hz. Each cube can swivel 360° to provide whatever balance of direct and reflected sound suit-

able to your liking and listening environment. Flexibility is also enhanced by a variety of mounting brackets and other accessories that enable you to mount the cubes virtually anywhere.

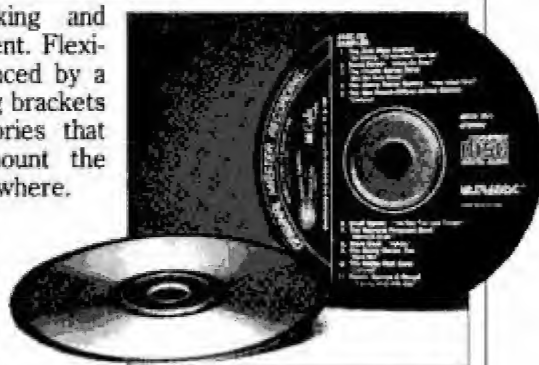
The Bose AM-5, listing for \$699, is an impressive achievement that takes a novel approach to the problem of sound dispersion. I do have some reservations about midrange response, the absence of which is most apparent on musical material lacking deep bass. Still, the AM-5's deep bass, wide soundstage and inconspicuous appearance might be a more than adequate trade-off, depending on the type of music you listen to. If space is a problem, the Bose AM-5 is a solution worth hearing.

Self-sufficient CD

Audio manufacturers are intent upon designing a compact disc player for every conceivable situation.

Sony, for example, now offers a CD player with a built-in 25-watt-per-channel amplifier and packaged with a pair of shelf-size speakers. No additional components are necessary. The charcoal gray CD player weighs just about 5 pounds and is small enough, as are the speakers, to fit into tight spaces encountered in studios, second bedrooms, dorms and even offices. At \$600, this product has many of the high-end features that will appeal to the dedicated CD listener although I feel a unit such as this would have a lot more versatility if it included an AM/FM tuner.

Sharp, meanwhile, is putting its eggs all in one basket with a unit that includes a CD



Gold-plated Ultradisc CD.

player, AM/FM tuner, and a seven-band graphic equalizer. Power output is rated at 100 watts per channel. This \$899 "CD/receiver" does offer the convenience of an all-in-one package and presumes the customer isn't willing to deal with individual components. The machine's target audience, however, might justifiably opt for a full component rack system at about the same price, and get a cassette deck and a pair of speakers in the bargain.

All That Glitters...

Though CD players of different designs and disc-loading capabilities have appeared on the market, the one constant has been the compact disc itself. Mobile Fidelity Sound Labs (MFSL), a Petaluma, California-based audiophile label, now says all CDs are not alike.

The company is introducing gold-plated Ultradisc CDs with a list price of \$29. MFSL claims the gold-plating prevents any chance of oxidation, which could affect conventional aluminum CDs if their plastic lamination has flaws. In addition, the splattering effect achieved by the

(Please turn to page 35)



New Sony CD player has built-in, 25-watts-per-channel amplifier.

Your home workshop can PAY-OFF

BIG...

Earn Extra Income
Right At Home.

START
YOUR OWN
MONEY
MAKING
BUSINESS!



FOLEY-BELSAW
3-IN-1
Power Feed
Power Tool.

SEND FOR
FACTS TODAY!

Planer Molder Saw

Three power tools in one —
a real money-maker for you!

The Planer/Molder/Saw is a versatile piece of machinery. It turns out profitable precision molding, trim, flooring, furniture... in all popular patterns. Rips, planes, molds separately... or all at once. Used by individual home craftsman, cabinet and picture framing shops, lumber yards, contractors and carpenters.

Never before has there been a three-way, heavy-duty woodworker that does so many jobs for so little cost. Saws to width, planes to desired thickness, and molds to any choice of patterns. Cuts any molding pattern you desire. Provides trouble-free performance. And is so simple to operate even beginners can use it!

30-Day FREE Trial! SEND FOR
NO OBLIGATION—NO SALESMAN WILL CALL
EXCITING FACTS

**RUSH COUPON
TODAY!**

Foley-Belsaw Co.
6301 Equitable Rd., Dept. 91111
Kansas City, Mo. 64120

FOLEY-BELSAW

FREE BOOK

☐ YES, please send me the FREE Booklet that gives me complete facts about your Planer-Molder-Saw and full details on how I can qualify for a 30-Day Free Trial right in my own shop. I understand there is No Obligation and that No Salesman will call.

Name _____

Address _____

City _____

State _____ Zip _____

AUDIO

(Continued from page 35)

gold-plating cuts down imperfections on the information-bearing surface of the disc, says MFSL, reducing the potential drop-out rate from a maximum of 40 percent to a maximum of 4 percent.

While MFSL's technical arguments are plausible, I perceived no audible difference between the conventional and Ultradisc versions of MFSL's Jazz Sampler that would prompt me to pay twice the price of a normal CD. If nothing else, however, the Ultradisc is an interesting novelty that might make a good gift.

DAT: Going Mobile

With digital audio tape decks being touted as a home recording medium on par with the sonic performance of compact discs, it is only a matter of time before car DAT players become available.

DAT for the car makes more sense, in fact, than compact discs.

With a disc 4 3/4 in. in diameter, an autosound compact disc player can only be so small. But a DAT cassette is half the size of a conventional analog cassette, so it is less likely that car DAT players will be adversely affected as dashboards become more shallow.

With DAT's small size, it might also be possible to make car players with built-in amplification and radio—the same as today's analog cassette/receivers. The compact disc's large size makes a separate amplifier a necessity, whether it be an independent unit or configured as a subchassis tied to the main unit. (The first autosound DAT players, though, will be offered as player-only devices.)

DAT's small size makes it destined for use in the car, but will the car unit be comparable to the home player? The



Clarion plans to offer this DAT for cars.

answer is yes. But just as there are some minor differences between home and car CD players, it seems there will be some minor differences between home and car DAT players.

Clarion, one of the world's largest car audio manufacturers, already is producing DAT players in Japan. The initial production run was just sent to car manufacturers in Europe, Asia and the U.S. as samples for review (the biggest part of Clarion's business is in supplying car radios to auto makers). But Clarion plans to offer car DAT players at retail too, with U.S. introduction expected to come in January. A tentative retail price for DAT model PA-5500A-A is \$1399, a

whopping figure that will probably drop as 1988 progresses.

Specifications obtained from Clarion for the PA-5500A-A show a variance with the published specifications for a typical home DAT player such as Sony's DTC-1000ES. While both players show a claimed dynamic range and signal-to-noise ratio of 92 dB, there are slight differences in the frequency response and distortion specifications.

Sony's home DAT player has a stated frequency response from 2 Hz to 22,000 Hz plus or minus 1/2 dB. The Clarion car player, by contrast, offers frequency response from 20 Hz to 20,000 Hz plus or minus 1 dB.

Sound above the 20,000 Hz level is generally recognized as being inaudible, and there isn't a home speaker (let alone a car speaker) that can reproduce sounds as low as 20 Hz. What these numbers do indicate is that autosound DAT's specs are favorably comparable to car CD players—and vastly superior to current car cassette/receivers. Present-day cassette/receivers average a frequency response from 40 Hz to 15,000 Hz in the tape department.

The second point of difference between home and car DAT is in the measurement of distortion. Sony's DTC-1000ES offers a total harmonic distortion (THD) figure of less than .005 percent while Clarion's PA-5500A-A car player weighs in at less than .05 percent. The lower the THD the better, but the difference here is purely a numerical one and should not produce an audible difference in performance.

Like a home DAT player, the Clarion car unit has two sampling frequencies, 44.1kHz for prerecorded digital tapes and 48kHz for homemade tapes. This dual-frequency system was instituted to prevent direct digital-to-digital copying. To make a tape of a CD on a home DAT recorder the signal must first pass through an analog conversion stage.

Clarion's PA-5500A-A does not have a sampling frequency of 32kHz, something included on some home DAT players, particularly the XD-Z1100 model introduced in Japan by JVC. This third sampling frequency is essentially a long-play mode which doubles the amount of recording and playback time to four from two hours. Frequency response at 32kHz is only 5 Hz to 14,500 Hz which limits its use to off-the-radio recording.

The car player does have the same fast-forward and rewind speed as a home deck—200 times faster than normal play speed. A 120-minute tape takes approximately 10 seconds to rewind.

In sum, we're going to have to wait a while before car DAT machines appear, but the wait will be worth the return. (The technical and legal aspects of DAT are covered in *Digital Audio Cassettes*, P. 106, and *Electronics*, P. 46.) **FM**

Save Gas, Save Engine with "POLY"

The following introduces one of the most fully tested and proven gas saving, friction-reducing engine treatments ever to reach the market!

The Secret is "Poly"

"Poly" is short for polytetrafluoroethylene (TFE), the slipperiest substance known to man. (1981 Guinness Book of World Records). Petrolon Corporation, makers of Slick 50, invented a way to permanently bind this slippery chemical to your engine with one treatment. Just one quart of Slick 50 can reduce engine friction, increase gas mileage and horsepower and reduce engine operating temperature, causing your oil and engine to last longer... plus it reduces metal wear, defraying costly overhauls.

Years of Testing and Use Have Proved It True!

Slick 50 has been thoroughly tested in independent laboratories and out on the road:

The March/April 1982, p. 35 issue of "Consumer Digest" magazine stated, "Slick 50 does reduce engine heat and ordinary wear, and our informal tests indicate that it will improve gas mileage by about 2 or 3 miles per gallon."

One of the country's most respected research institutes reported applying a powerful ultrasonic cleaning process to a Slick 50 treated engine and were surprised at its permanence. "We actually expected the Petrolon Slick 50 TFE Resin coating to also be removed, but later found it was still there."

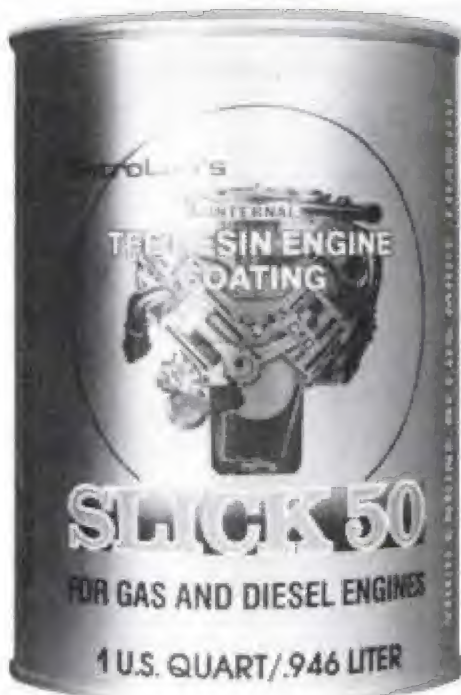
"Dune Buggies & Hot VWs" magazine April 1983 issue records the results of their one year testing of Slick 50. "We can indeed say scientifically that Slick 50 does work, and that it does reduce engine wear!... for the price of one treatment when compared to engine rebuild, we feel that you'd be money ahead using Slick 50."

The Federal Aviation Administration has fully accepted a similar product for aircraft—Slick 50 Aircraft Piston Engine Treatment (F.A.R. #33.49). This FAA endurance test simulated 1400 hours of engine use.

The power technology laboratory at a leading southwestern university stated, "Slick 50 does increase horsepower and decreases fuel consumption in tests done at the university."

The Space Shuttle Columbia uses the chemical "poly" in its gears and bearings because it is the only chemical lubricant which can withstand the heat and corrosive elements of space.

Perhaps most dramatic of all is a torture test overseen by the Automotive Services Council for Pennsylvania and shown on WTVE television. Three cars with 75,000 to 129,000 miles on them were treated with Slick 50. Six months later the oil was drained from each vehicle, and the cars driven without the oil plugs for about a half hour. The water temperature never rose and the engines sustained no apparent damage.



There isn't room here to tell you about the dozens of other tests proving that Slick 50 is everything we say. However, if you're still skeptical, send \$2.00 to cover printing and postage costs, and we'll send you detailed test results plus actual letters from users who report how Slick 50 saved their engines and saved them money!

It's Easy to Treat Your Engine

A few minutes before oil and filter change, add the engine flush you get free with each order to clean out the engine. Let the engine idle for 5 minutes. Then drain the oil, change the filter and add the proper amount of oil, less one quart. Add one quart of Slick 50, drive for 30 minutes, and leave it in the crankcase for at least 3,000 miles. As the engine operates, the oil carries the "poly" between the parts where it is burnished into the pores of the metal.

Only One Treatment Necessary

It's permanent, so you do it only once, not each time you change oil. One quart of Slick 50 will treat all standard 4, 6 and 8-cylinder gasoline and diesel engines.

Works with Most Oils

Slick 50 will work with all petroleum-based oils and all synthetics compatible with petroleum-based oils with the exception of graphite oils. However, once an engine is treated, you can go back to a graphite type if desired.

4 Ways Slick 50 Saves You Money

Your actual percentages may vary depending on your driving, vehicle condition, weather and geographic location, but no matter what your conditions, Slick 50 can:

1. Increase mileage
2. Increase horsepower (small economy cars and large RV's really need this)

3. Reduce operating temperatures, thus increasing the lubrication and life of the oil and engine

4. Minimize or eliminate costly overhauls by reducing engine wear

Up to 90% of the engine wear on a car can be caused by lubrication starvation cars experience when first started before the oil begins to circulate. Slick 50 can eliminate this problem for less than the cost of two tanks of gas.

Slick 50 Will Not Affect Your Warranty

Slick 50 is suspended in an excellent grade of petroleum oil which meets or exceeds every manufacturer's engine warranty requirements. In addition, this oil carries an American Petroleum Institute service classification SF-CC-CD.

There's No Risk with Our Money Back Guarantee

Use Slick 50 for 3000 miles. If you don't notice an improvement in engine performance, return your invoice with a short note telling why, for a prompt full refund — no questions asked.

Profit from Selling Slick 50 Yourself

Here's an opportunity to make handsome profits. Having such solid test results from major institutions make Slick 50 easier to sell than many other products. Free dealership information is sent upon request.

For purchase or further information call toll-free 1-800-525-8624, ext 7 (in California 1-800-233-9559) or send to: Progressive Energy Corporation, 255 South Bent Avenue, #B-1, Dept. PM787, San Marcos, California 92069.

Yes, I want to improve my car's performance and save my engine — rush me risk free

☐ One Slick 50 at \$39.95 + \$4.00 shipping and handling. Calif. Residents add 6% Sales Tax.

☐ Give me free shipping and handling for my order of 2 or more at \$39.95 each.

☐ Check ☐ C.O.D. ☐ Visa/MasterCard

Card # _____

Exp. Date _____

Name _____

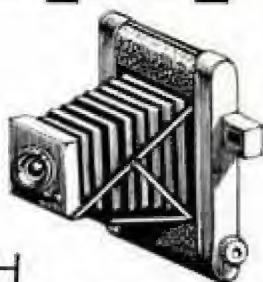
Address _____
(Give street address if possible for UPS delivery)

City _____ State _____ Zip _____

PEC
Progressive Energy Corporation

255 South Bent Avenue, #B-1, Dept. PM787
San Marcos, California 92069
CALL NOW, TOLL FREE 1-800-525-8624.
IN CALIFORNIA, TOLL FREE 1-800-233-9559.
©1987 Progressive Energy Corp

Photography



BY STEPHEN A. BOOTH

Mobile Image-Makers

Summertime is open season for snapshotting. The temperate weather, and additional leisure time, combine to provide a wider variety of subjects and more photographic opportunities than any other time of year.

Summer's also the time when most of us prefer to dress and travel light. Whether you're daytripping to the beach, hiking a mountain trail, or clocking an evening of thrills at the amusement park, a full-dress pack of photo gear is probably the last thing you'll want to carry.

This column has often addressed the flexibility of conventional, single-lens-reflex 35mm cameras and their battery of interchangeable lenses to handle any photographic sit-

uation. We've also discussed the convenience, compact size and carefree operation of the point-and-shoot autofocus 35mm rangefinder. The latter is the ideal on-the-go imaging device, easily tucked into a beachbag, backpack or an especially spacious pocket.

Now you can have the best of both worlds, in the form of auto-everything rangefinders with variable-focal-length lenses built-in.

These supercompacts are advertised under a variety of aliases. Most often, they're dubbed bifocal, a.k.a. dual-lens autofocus cameras. What they offer, in most cases, is the ability to switch

from the normal lense to a telephoto, internally—without physically removing and installing a lens. Usually, the transformation is accomplished by manipulating a lever on the back of the camera. Sometimes, you have to rotate the lens turret itself. In either case, the business end of the lens changes perspective instantly, enabling you to zoom from a group shot to a tightly cropped closeup.

basic features shared by bifocals yet bring some extra surprises to the party.

Most bifocals offer you a choice between a semi-wide-angle 35 or 40mm lens (in the normal mode) and a 70mm moderate telephoto. In fact,



Pentax IQZoom (above) and Canon Sure Shot Tele zoom from normal to close-up telephoto.



40mm and 70mm is exactly the either/or focal range you get in the Canon.

The Pentax IQZoom is a bit more flexible, as connoted by its name. By a neat application of electromechanical engineering, the powered lens of the IQZoom can be set to any focal length you desire between 35 and 70mm. You simply press the power zoom switch until the subject is cropped the way you wish it to be.

To assist you in this composition, the viewfinder optics follow the lens adjustment millimeter-for-millimeter. This means that what you see is exactly what you'll get. As the lens and viewfinder zoom, so does the built-in flash. Meanwhile, your subject remains consistently focused by the infrared autofocus sensor.

The viewfinder optics of Canon's Sure Shot Tele also change when you slide the 40mm to 70mm switch on the back of the camera. Though it is limited to either/or focal lengths, the Canon compact offers two built-in features for

(Please turn to page 43)

PM Photo Album—Tips For Better Pictures

Autofocusing point-and-shoot cameras make everyday photography simple. But there are occasions when some control over the autofocus function is desirable.

For example, when shooting through glass, water or fog, the camera's infrared autofocus sensor will reflect off the transparent surface rather than home-in on the object behind it that you're trying to shoot. The result is a perfectly focused image of, say, your windshield, rather than the scenery beyond it. Water and even fog have the same reflective effect.

Some autofocus cameras have a focus-lock feature. This lets you focus on a reference subject, then holds the reading until you recompose the actual shot and press the shutter release. If your camera lacks this feature, or if there's no way for you to prefocus, just cover the autofocus sensors as shown here (top left). The camera's focus system will default to infinity and let you shoot right through glass (bottom left).—Armand Ensarian



There's no other truck like it.



The Mid-Sized Dodge Dakota.

With full-sized ability and compact agility, Dodge Dakota is in a class by itself. Ready to haul with available V-6 power, eight-foot bed and 2,550 lb. payload. The rival of some full-sized Ford and Chevy pickups. And the envy of every compact around. What's more, when you choose Dakota as your pickup, you get plenty of choice. From a no-nonsense Dakota S at only \$6,590*, to the dressed-up and ready-for-Saturday-night Dakota LE shown above. Still, only \$9,769*. So buy or lease a new mid-sized Dodge Dakota. It's a singular sensation.

*List prices exclude tax & destination charge.

Best Built based on survey of owner problems with '86 light trucks designed & built in No. America & sold Oct.-Nov. '85 (5 mos. avg. usage). See 7/70 powertrain & 7/100 outer body rust-thru limited warranty at dealer. Restrictions apply.

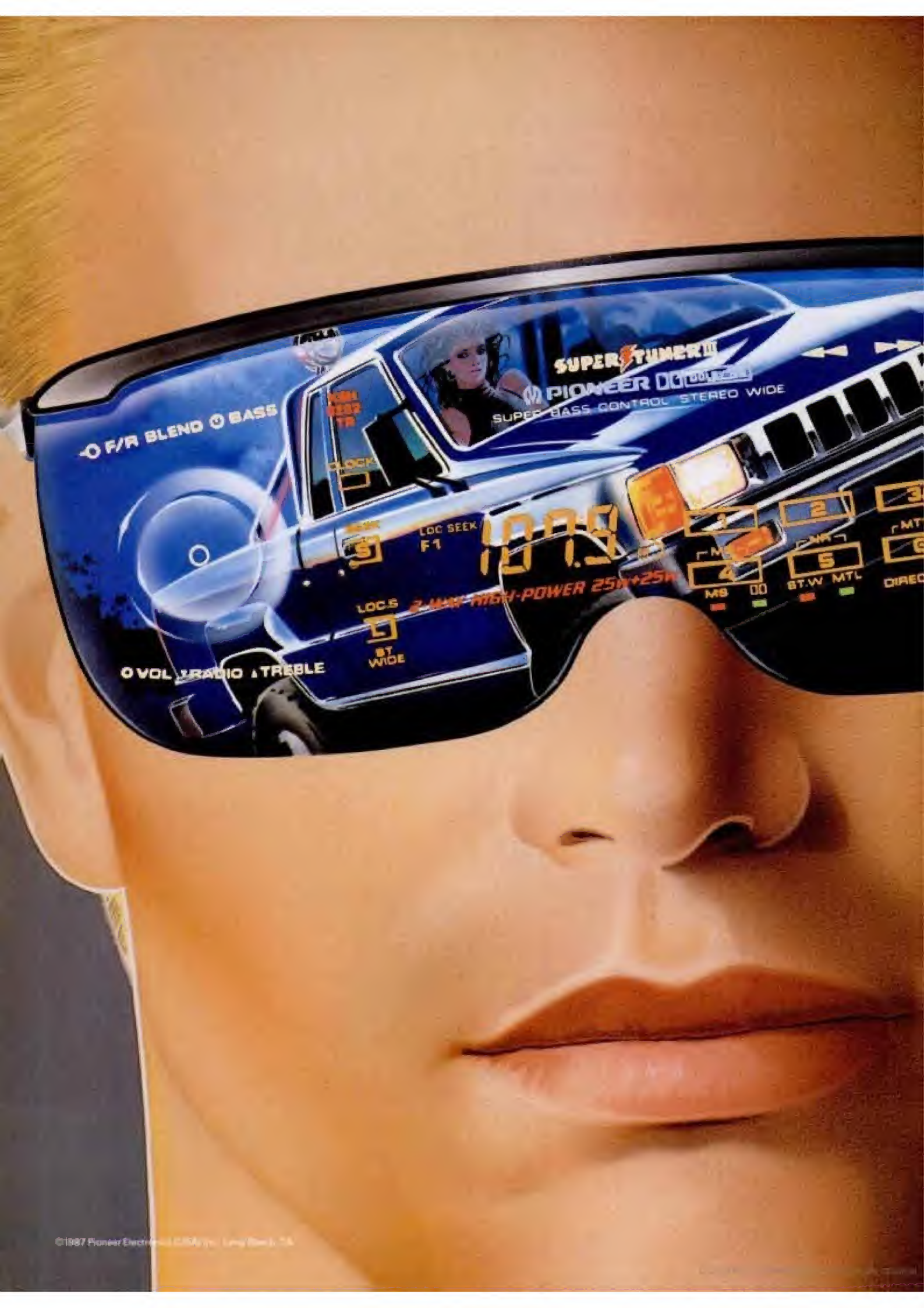


7/70

DIVISION OF CHRYSLER MOTORS

THE BEST BUILT, BEST BACKED AMERICAN TRUCKS ARE RAM TOUGH†

BUCKLE UP FOR SAFETY.



The World's First Truck Stereo Kicks Bass.

Introducing Pioneer's Truck Riders.™ The first audio systems designed exclusively for trucks. Understand, this isn't a car stereo attached to a pair of car speakers. This is a complete truck sound system designed to work as one.

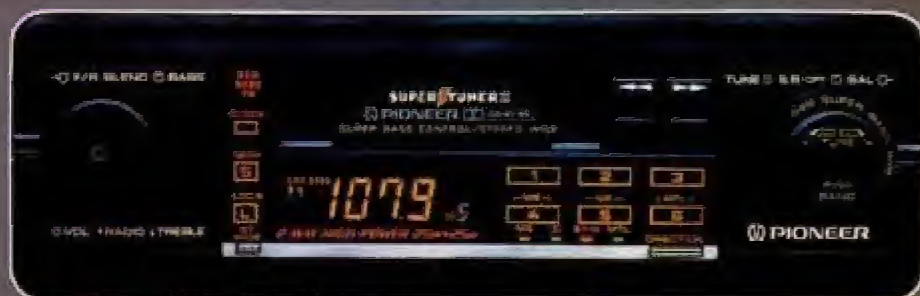
It all starts in the dash with a tough, 50-watt, impact-resistant AM/FM cassette deck. And it comes out of specially designed behind-the-seat speakers that pound the sound right into your spine. Yet before it even reaches your brain, it's been fine tuned by Pioneer innovations like Super Bass,

Stereo Wide, and Front/Rear Blend Control. The result: Your cab literally explodes with crystal clear sound.

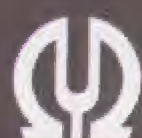
Pioneer's tough new Truck Riders.™ Go ahead. Kick some bass.



TS-TRX5 Truck Speakers



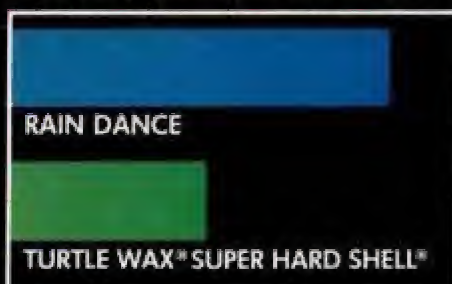
KEH-8282TR AM/FM Cassette Deck

 **PIONEER®**

**AFTER
1700 HOURS
OF RAIN,
HEAT, AND WIND,
ONLY ONE
CAR WAX WENT
THE DISTANCE.
RAIN DANCE.**



Tests prove Rain Dance® lasts up to twice as long as the leading car wax.



Water beading tests after 1700 hours.
Rain Dance holds up after other
leading car waxes fall flat.

Punishing rainstorms. Blistering sun. Repeated detergent washings. We put the leading car waxes to the test in Florida to find out which brand lasts longest. The winner: Rain Dance by a mile.

In fact, water beading measurements showed Rain Dance lasted more than twice as long as the other leading brand. Which means with Rain Dance, you can wax a lot less often.

So if you want the longest-lasting car wax, get Rain Dance. The wax that polished off the competition. © Borden Inc 1987



RAIN DANCE. INTENSIVE CARE FOR YOUR CAR.

PHOTOGRAPHY

(Continued from page 38)

creative photography. One is a soft filter that drops in front of the lens at the touch of a button, to lend a dreamy quality to portraits or landscapes. The other creative feature is the ability to make multiple exposures on the same frame of film. In fact, the Sure Shot Tele comes with a lens-mounted adapter for making trick special-effect multi-exposures.

Both cameras offer the usual complement of automatic-exposure and film-handling features. The Pentax focuses down to 2 ft.; the Canon to 3 ft. Additionally, each is available in a data-back version that imprints date and time information on the exposure. The Pentax IQZoom and Canon Sure Shot Tele list for about \$350. Add \$35, respectively, for the data-back versions.

Summertime Clues

As long as we're on the subject of summertime photography, here's a potpourri



Trek-50 is moisture and debris resistant.

of tips for film and camera handling.

■ Airport security regulations require you to submit your carry-on bags for X-ray inspection. And increasingly, even luggage stowed in the hold is subjected to X-ray examination.

X-rays can affect film adversely—whether it's unused or already exposed. According to the National Association of Photographic Manufacturers, the low-dosage X-ray machines used in the U.S. will let films of ASA/ISO 400 and below pass through five times before visibly affecting them. Fast films with higher ISO numbers stand a greater risk, and should never be exposed to X-rays. The machines used overseas can administer higher dosages.

Why take chances with your valued pictures? In the U.S., you have the right to request hand-inspection of your baggage. Simply remove your camera and film from the bag and hand them to the security guard.

Security at most overseas airports will also accommodate this request—if you can communicate it. You might have to insist over the guards' assurances that the X-ray machine is "film-safe."

Some countries do not permit any hand-inspection. In this case, protect your pictures by enclosing the film in one of the

many lead-foil bags sold for this purpose. Make sure your foil bag hasn't sprouted leaks caused by overuse or age. Even a pinhole fault will admit X-rays.

■ Heat, humidity, water and debris can foul your film and camera, too. Excessive heat can cause LCD displays to go blank and electronic microprocessors to go goofy. Internal lubricants might soften and run to places they don't belong. As for film, high heat and humidity can alter the chemistry of the photosensitive emulsion, resulting in fogging and color imbalances. Trouble is, you won't know until after the film is processed.

Cool is the rule. Don't leave your photo gear in direct sun or in enclosed spaces (such as cars) where the mercury's likely to rise above a comfortable room temperature. If you've got a beverage cooler on hand, sacrifice some brew capacity for camera and film protected in polybags. When you shift the package from cold storage to the heat, leave the gear in the bag a while so that any condensation forms on the bag instead of its contents. No cooler? Keep the photo paraphernalia in shade or covered under light colored, heat-reflecting material.

The damaging effects of water, sand and dust are pretty obvious. If you expect to take your camera along for bodysurfing or mud-wrestling, get one of the readily available moisture- and debris-resistant cameras such as Vivitar's Trek-50.

New And Noteworthy

Two new SLR cameras have joined the exclusive autofocus fraternity. They are Yashica's 230AF and the Pentax SF1. Notably, they share a built-in flash. Stay tuned for a hands-on report. **PM**



Built-in flash is an added convenience of the Yashica 230AF (above) and Pentax SF1.



BANKS TURBO POWER Flattens Out Those Hills

BANKS DIESEL TURBO SYSTEMS



FORD 6.9L TURBO
GM 6.2L TURBO ALSO AVAILABLE

- EMISSIONS LEGAL IN ALL 50 STATES
- UP TO 50% MORE HORSEPOWER
- EXCELLENT HIGH ALTITUDE POWER
- DEALERS NATIONWIDE
- YOUR POWER SOURCE "SINCE 1958"

banks™

Gale Banks Engineering
546 Duggan Avenue, Dept. 650
Azusa, Ca. 91702 (818) 969-9605
© 1987 GALE BANKS ENGINEERING

Train at home for one of these 27 career opportunities

Free facts about Diplomas and Specialized Associate Degrees

Now at home in your spare time, without any previous experience, you can train for a money-making career...even get a Degree. Send for free career facts about the exciting career program that interests you most. You will receive color brochure and information on employment opportunities in the field you choose. Mail coupon today and see how easy it is to train at home for a great new career or advancement on your present job.



SEND FOR FREE FACTS! 10021

ICS International Correspondence Schools
Dept. PBS77 Scranton, PA 18515

Please send me free facts, color brochure and full information on how I can study at home for the career I have chosen. I understand I am under no obligation and no salesman will visit. **CHECK ONE BOX ONLY!**

ASSOCIATE IN SPECIALIZED BUSINESS DEGREE PROGRAMS

- ☐ Business Management
- ☐ Accounting
- ☐ Business Management with option in Finance
- ☐ Business Management with option in Marketing

ASSOCIATE IN SPECIALIZED TECHNOLOGY DEGREE PROGRAMS

- ☐ Mechanical Engineering Technology
- ☐ Civil Engineering Technology
- ☐ Electrical Engineering Technology
- ☐ Electronics Technology

CAREER DIPLOMA PROGRAMS

- ☐ High School
- ☐ Auto Mechanics
- ☐ TV/VCR Repair
- ☐ Surveying & Mapping
- ☐ Drafting
- ☐ Electronics
- ☐ Wildlife Forestry Conservation
- ☐ Computer Programming
- ☐ Diesel Mechanics
- ☐ Electrician

- ☐ Small Business Mgmt.
- ☐ Microcomputer Repair
- ☐ Gun Repair
- ☐ Motorcycle Repair
- ☐ Police Sciences
- ☐ Catering/Gourmet Cooking
- ☐ Bookkeeping
- ☐ Art
- ☐ Fitness & Nutrition

These courses are offered by ICS and North American Correspondence Schools.

NAME _____ AGE _____

STREET _____ APT. _____

CITY/STATE/ZIP _____

Motorsports

BY NORMAN
MAYERSOHN



Pull Right Up, Please



Trio of blown Hemis in staircase layout equals 4500 hp.

If you look no deeper than the freak show spectacle of it all, tractor pulling would seem the most ludicrous of motorsports. Just consider the numbers: \$150,000 machines with up to six engines and 8000 hp or more, dragging a 70,000-pound sled down a dirt track.

Certainly there must be more than meets the eye in order to pack a sports arena with fans for an evening of mud-slinging, engine-roaring entertainment.

There's lots more—a mechanical wonderland, in fact. What makes the machinery so interesting is its specialization. Just one tractor is on the course at any time, and its true competition is a dead-weight sled. It's more like the Olympic pole vault than any other motorsport—each puller is trying to exceed a measured mark rather than defeat the competition in a side-by-side matchup.

While other racers abide by the maxim "there's no substitute for cubic inches," tractor pullers pass on the tedious standbys of increas-

coupler, nose to tail, or through a specially built gear-case that positions them side-by-side or in a terraced "staircase" layout. A purpose-built, twin-countershaft transmission offers the choice of three gear ratios, though there's no shifting of gears once a tractor pull has started.

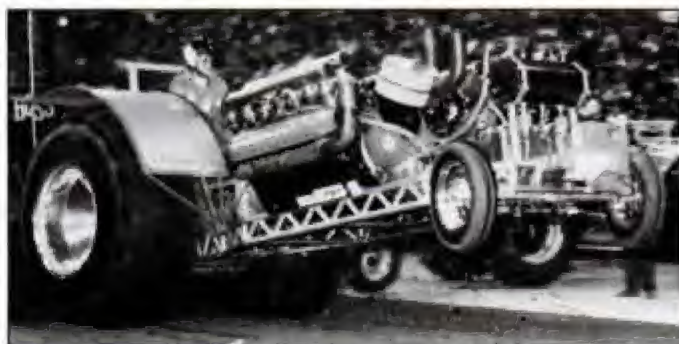
Drag-racing style centrifugal clutches enable smooth launches, and a Rockwell rear axle out of an 18-wheeler is modified with an additional Caterpillar bulldozer planetary reduction gear-

set to help move the weight.

Engine choices in the top classes range from the latest dragster setups of Arias-Root 604-cu.-in. Hemis, complete with GMC 12-71 superchargers, to World War II surplus Allison V12 aircraft powerplants. A mix-and-match attitude is perfectly acceptable—Allison devotee Hale Woodward, for example, will be adding two 427 Chevrolets to his tractor, just for "something different." Engine location itself is a topic of much discussion, since the motor mass can act as



Two-wheel-drive trucks go wheels up when hitched to weight sled.



A pair of aircraft Allison V12s provide 3000 hp of pull.

ing bore and stroke by simply multiplying the number of powerplants. Currently, the top bracket (11,200-pound class) is limited to a maximum of six engines for outdoor events, or three powerplants for indoor meets like the Red Man Chewing Tobacco/TNT All-American Pulling Series, a show we took in at Long Island's Nassau Coliseum.

The multi-engine tractors are built on custom rectangular tube framework with engine mounts that allow drivers to choose the number of engines for the weight class and course location they'll be running. Engines are linked either by a direct crankshaft

movable ballast, and at least one competitor has chosen a sideways-mounting scheme in an attempt to control torque reaction.

Pulling is a long way from the Indianapolis 500, but for the hard-core motorsports fan it's terrific entertainment with a great advantage: Pulls run nearly every weekend of the year, if not locally, then on cable television. **PM**

FREE RACE TICKET FOR PM READERS

Send in this coupon with a stamped, self-addressed business envelope to:

**Auto Sports Associates, Ltd., 701 N. Keyser Ave.,
Scranton, PA 18508.**

You will be mailed a free Grandstand Ticket worth the \$10 admission to the garage, paddock and race on one day of the Pocono Sports Car Grand Prix, July 25-26 at world-famous Pocono Raceway, Long Pond, Pennsylvania.

It's the largest sports car race in the Northeast—14 races for 22 classes of SCCA sports cars, sedans and Formula cars over a 2-day weekend.

The International Camaro Club will also be on hand to celebrate that model's 20th birthday at the Camaro Street National East. Camaro fans will see a Camaro-only car show, swap meet and Camaro Corral at the race track.

JUST MAIL IN THIS COUPON (no photocopies, please) FOR YOUR FREE RACE TICKET.

"These Are **NOT...** Sunglasses!"

Famous Nationally
Advertised
Ambervision™
Super Glasses
For Only...

\$10?

(Not \$59.95)



AMBERVISION™ REVOLUTIONIZES EYEWEAR

As part of an enormous publicity campaign to prove that we have the absolute lowest prices available in the nation, the giant new home shopping club "USA Buyers Network" will give away one million pair of its most expensive vision enhancement glasses — the nationally advertised Ambervision™ Super-Glasses, for the unbelievable "competition-buster" price of just \$10 only to those who write to the company address (below) before Midnight, July 31, 1987

**Not \$100, Not \$59.95 — Incredible
Give Away For Only \$10!**

Similar Perception eyeglasses have been nationally advertised by others in leading media at \$59.95 each. In fact, you would think that high-tech Perception vision enhancement Super-Glasses like these would sell for well over \$100.00. But during this nationwide publicity campaign, you don't pay \$100.00 — or even \$59.95. You pay an incredible give away price of just \$10! But this offer is for a limited time and only available through THIS nationwide publicity campaign if you respond before the deadline above.

High Technology Disguised As High Fashion

Don't be fooled by the appearance of these glasses! These are not ordinary sunglasses. They may look like high fashion sunglasses (in fact, they are designed after some of the most expensive brand names on the market today — e.g. Porche™, Carrera™, etc.) — but are actually the latest breakthrough in sunglass technology. Ambervision's™ scientific design filters out blue and ultraviolet por-

tions of the light spectrum that have been proven to be harmful to your eyes. By filtering out these dangerous rays, not only are your eyes protected from damage, but your vision is enhanced to a new level of perceptual eyesight!

A New World Through New Eyes

Just imagine what it would be like to look through glasses that make the world seem sharper, more vibrant, more alive and more cheerful. Slip on a pair of these sleek designer sunglass "look alikes" and you'll notice a marked improvement in your vision. Everything will appear sharper and more defined. Objects will take on an enhanced three dimensional (3-D) effect. This vision enhancement experience is so incredibly phenomenal that it has been widely publicized by others as a "Vision Breakthrough". You literally "won't believe your eyes!" Thousands of professional golfers, hunters, and skiers have already discovered and reaped the benefits of these indispensable Super-Glasses — now you too can experience the excitement of ENHANCED EYESIGHT!

Sunglass Danger?

The unbelievable truth is that ORDINARY sunglasses may be dangerous to your eyes. When you put on sunglasses, although you reduce the amount of light that enters your eyes, your pupils open wider (just like the aperture on an automatic camera) and actually allow more of the dangerous ultraviolet rays into your eyes.

These "Super-Glasses" are especially designed to shield out overhead light. Doctors will tell you that the CR-39 lens used in

these glasses are one of the finest materials available for glasses and is manufactured under license. The lightweight frames are designed for ultra comfortable wear and tear and the molded nose rest will fit any size nose. The hinge design of these frames allows them to be the perfect "one size fits all" eyeglasses. Each pair comes complete with a padded carrying case and an anti-scratch coating. No wonder these are the most popular and fastest selling sunglasses ever sold by this giant new home shopping club!

These Ambervision™ Super-Glasses will not be sold to any wholesalers, dealers, or retailers at this price. They are only available through this special publicity campaign for a limited time. There is a limit of two (2) pairs per address at this price, but requests that are mailed early enough (before July 20), may request up to five. Each pair of Super-Glasses is covered by a full one year money back guarantee.

TO ORDER, mail this original publicity ad (no copies or photostats) together with your name and address and \$10 for each pair. Add only \$3 for FIRST PRIORITY shipping, handling and insurance no matter how many pairs you are requesting. MC & Visa users please supply Account No., Expiration Date and Signature. (State sales tax included in price). Allow up to 60 days for shipment. Mail to:

**USA Buyers Network, Dept. SG1032
One American Way,
Roanoke, VA 24016-8033**

© USA Buyers Network, 1987
Ambervision is a trademark of the USA Buyers Network

USA
BUYERS NETWORK

Electronics



BY STEPHEN A. BOOTH

Enemies Of Promise

In case you haven't already noticed, this month's issue contains our exclusive hands-on test of the new digital audio tape (DAT) format recently introduced in Japan. That test report might be as close as you'll ever get to a DAT recorder, if the corporate entities collectively known as the music industry have their way.

DAT, within the confines of its tiny cassette shell, has the potential for the same high-quality sound you'll hear from digital audio compact discs.



The digital audio tape recorder might be an endangered species.

Unlike CDs, the DAT format permits recording, either commercially or in the home. It's the home-recording aspect of DAT that the music industry objects to. Consequently, that industry has lobbied Congress for restrictions on DAT. Some of these restrictions are included in proposed legislation now before our elected representatives.

Though the immediate and apparent target of the music industry's lobbying is DAT, I'm probably not alone in suspecting that the ultimate goal is to restrict (or even prohibit) private home taping of any kind, including video. DAT, because it is new technology and highly publicized at that, appears merely to be a convenient vehicle for a renewed attack on home recording of copyrighted works.

There is much that I and others find objectionable in the music industry's campaign. Its very premise—the alleged loss of revenues—is questionable. But whatever be the rights and wrongs of home taping, banning or crippling a new technology isn't the solution. It's a narrow-minded action that would deprive us of the benefits and promise of digital audio. I even think it's shortsighted from the point of view of the music industry's own self-interest.

In seeking restrictions on DAT, the music industry has endowed it with the nonexistent ability to make perfect digital clones of the compact disc. The music industry argues that given this ability, people will stop buying CDs. Instead, they'll buy DAT machines, and either borrow CDs from friends or cadge DAT copies of the discs.

To prevent this swapping and borrowing, the music industry has proposed a ban on the importation of DAT decks that lack a built-in, anticopying device developed by CBS. This chip would prevent the machine from recording any specially encoded CD (and presumably LP, cassette or radio broad-

(Please turn to page 48)

Magic Wand

Remote control, wireless or otherwise, used to be a premium feature found only in top-of-the-line electronic entertainment products. Nowadays, it's hard to find a VCR or TV set that doesn't come with a remote control handset of the wireless infrared variety. Besides video products, just about every compact disc player sold comes with a remote.

So do many hi-fi receivers and rack-mounted audio component systems.

When you begin amassing more than one remote-control component, you begin to realize that this electronic solution to one problem (inconvenience) has engendered yet another one. Your coffee table now is cluttered with a variety of remote controls. You have to select the right one—possibly in semi-darkness—to control the component in use. Furthermore, you have to refamiliarize yourself with the placement of the functions on that particular controller so that you don't shut your VCR off when you merely want to advance the tape.

Electronics manufacturers have attempted to solve the problem of redundant remotes in two ways.

Some companies sell their products with a remote control that will operate their other remote-control products. This is a step in the right direction—but it limits your selection to products of a single brand. Other companies sell, for example, a TV whose remote will control VCRs of any brand. This gives you more flexibility, but you're still limited to controlling only two components.

Yet another solution has been the so-called universal remote control. This clever bit of engineering, first introduced in General Electric's Command Central remotes, can learn the operating codes of virtually any component that uses infrared control. The Command Central can operate up to four components—a reasonable number.

Its limiting factor is the number of functions it can perform. For the most part, it issues only basic commands such as power, channel selection, stop-start-and-pause, and audio volume. It won't let you control the track selection on a CD player, for example, or let you alter the bass, treble or left/right stereo balance of your hi-fi system.

Now, the infrared remote controller that will do all those things and more is available from hi-fi manufacturer Onkyo, of Ramsey, New Jersey.

The model RC-AVI Unifier (about \$120) can learn the code of virtually any infrared remote-control device. Moreover, it can duplicate and operate the functions of the related component. In all, more than 100 different functions can be stored in the Unifier's microprocessor memory. The Unifier is simply placed head-to-head with the original remote to learn its codes and functions.

Besides operating audio and video gear, the Unifier has an Auxiliary mode that can handle any infrared-controlled product—including home security systems. It runs on four AAA batteries.



Unifier remote by Onkyo operates any audio/video unit.



New Jeep Comanche Sport Truck

\$6495.*

AND IT'S ALL JEEP.

1987 COMANCHE SPORTTRUCK: It's not only the newest 2-wheel drive Comanche pickup, it's also the most affordable vehicle Jeep builds. At just \$6,495, SportTruck has the most powerful standard engine of any truck in its class... delivering an impressive 121 horsepower. Plus, it's the only vehicle in its class with big 15-inch wheels and tires, standard.

POWER: This year, Comanche comes with an all-new optional 4.0 litre Power-Tech Six engine that puts out

173 horsepower and 220 foot-pounds of torque. That makes Comanche by far the most powerful truck of its kind.

A WIDE RANGE OF VEHICLES: Comanche gives you the choice of two-wheel drive or shift-on-the-fly four-wheel drive. And you can choose between the new shortbed model or longbed with the largest optional


4-wheel drive payload capacity of any truck in its class.

OTHER OPTIONS: Comanche already has a lot going for it. And there's a long list of available equipment that includes a responsive new 4-speed automatic transmission with overdrive.

Check out the new SportTruck and all the other Comanche pickups. It's the kind of truck just about anybody can afford. But it's also the kind of truck only Jeep can build.

MSRP. Manufacturer's suggested retail price. Title, taxes and destination charges, and options are extra. Price may change without notice. Safety belts save lives.



Jeep  Comanche
Available in 2WD and 4WD

FIX THAT SCRATCH



WITH AN EXACT MATCH



FROM DUPLI-COLOR®

All Dupli-Color® touch-up paints are computer-matched to the original factory finish! And a wide array of colors are available for both domestic and import vehicles.



SCRATCH-FIX®—For touching up nicks, dings, minor stone damage and scratches on late model vehicles. Easy-to-use brush-in-cap.



AUTO SPRAY®—As the scrapes and scratches get larger... Auto Spray® is the answer. Dries quickly to a durable, high-gloss finish.



TRUCK & VAN PAINT—Perfect for touching up large areas on pick-ups, vans and RVs. Also ideal for custom painting tool boxes and other accessories.

FREE! For a step-by-step "You Can Do It" guide to expert auto touch-up, send self-addressed stamped envelope (4" x 9½") to: Dupli-Color Products Company, Dept PM, 1601 Nicholas Blvd., Elk Grove Village, IL 60007.

THE DUPLI-COLOR DYNAMITE DUO REBATE/SWEEPSTAKES

Purchase any two cans of Dupli-Color® or Original® brand aerosol products and receive a \$1.00 rebate check.

PLUS Enter to win a matching pair of ATVs or one of hundreds of other prizes.

See your favorite Dupli-Color retailer for complete details. Rebate and sweepstakes offer valid through July 15, 1987.

DUPLI-COLOR®

ELECTRONICS

(Continued from page 46)

cast). The so-called encoding that triggers the chip is actually a notch of music in the high-frequency 3715-Hz to 3965-Hz range that is removed from the performance momentarily.

The chip's proponents claim that the encoding scheme doesn't distort or adversely affect the music during normal playback. Opponents strongly disagree, pointing out that the 3715- to 3965-Hz bandwidth is well within the range of hearing and that its removal audibly distorts the music.

To my thinking, the music industry's contention that DAT makes perfect CD clones is either misinformed, or intentionally exaggerated. Our firsthand experience with a DAT recorder demonstrates that the machine isn't the bogeyman the music industry alleges it to be. You can read exactly what the decks can and can't do, described in our story titled *Digital Audio Cassettes* starting on page 106.

As for the CBS-developed anticopy system, it seems unworkable—and it's certainly unnecessary.

The affected bandwidth is certainly within the audible range, and besides the momentary loss of sound, any alteration in this band is likely to affect stereo imaging—the direction from which we perceive the sounds to come.

If the notch system is implemented, it would impose inferior music recordings on anyone who buys a CD or LP, not just the folks trying to record one onto a DAT recorder.

Why isn't the CBS anticopy system necessary? Because as our feature article points out, DAT players already have a built-in "copy prohibit" system that prevents the machine from making a digital recording of any CD (or future prerecorded DAT cassette) that has an anticopy code. Most CDs sold today already have this nonavailable code.

Technical reasons aside, I'm also skeptical of the music industry's contention that DAT's introduction will prompt widespread source-swapping and copying. It just doesn't make financial sense.

DAT isn't cheap. In Japan, the decks cost about \$1300 and the cassettes about \$13. They'll cost more when they get here—but let's assume for a moment that the prices drop by half in a year's time.

I can't see why a person—or an overwhelming number of persons—would pay \$650 for a DAT deck and \$6.50 for a blank cassette when one could buy a CD player for less than \$200 and CDs probably at \$10 a pop next year. You'd still have to get a CD player and CDs to copy on the DAT deck. And the copy you'd get won't be a digital-to-digital transfer. The need to go through

an analog stage on current machines prevents that.

For anyone looking to obtain the maximum benefit from DAT, we're looking at an expensive proposition. Copying a CD onto the DAT format only makes sense if the tape copy is to be used in a DAT car player (or possibly in a future DAT headphone portable). I can't imagine why anyone would make a DAT copy of a CD to listen to at home, when that person could listen to the original, all-digital CD.

To outfit your car for DAT, you're looking at a retail ticket of about \$1300. The home deck needed to make the copies cost as much—and you'd still need a CD player and CDs to copy from. I find it hard to believe that many people willing or able to go to such expense will try to save a few bucks by copying someone else's CDs. As for using DAT to copy LPs, cassettes or broadcasts—why bother? Existing, inexpensive analog recorders already do the job.

Prospective owners of DAT hardware wouldn't have to copy CDs at all—or want to—if music companies were to sell prerecorded DAT cassettes just the way they sell CDs.

At this writing, no prerecorded DAT is available at retail, and no major music label has expressed an interest in selling the format. Theoretically, a prerecorded DAT cassette made from the same digital master as a CD should sound just as good as a CD—some folks say better. Before our test report on DAT went to print, we were unable to acquire any digitally mastered (at 44.1kHz) DAT tapes. Soon afterward, we did get such an opportunity. The prerecorded tape sounded as good as any CD I've ever heard. It's for this reason that I suggested, earlier, that the music industry's antipathy to DAT might work against its own self-interest.

DAT players for the car are already being made in sample production runs. Walkman-type DAT portables are on the drawing boards. DAT, because of its size and immunity to vibration and shock, is a more sensible format for mobile use than CD. For many years, the music industry took a lackadaisical attitude toward prerecorded analog cassettes. Then the Walkman boom woke up the music giants. Cassettes today far outsell LP records. Had high-quality, reasonably priced, prerecorded cassettes been readily available soon after the first car players and headphone portables arrived, there probably would be less home recording (from LP or other sources) today.

When the music industry bellyaches about lost revenue, I have to ask the question: Who lost it? If you want to save DAT, tell your representatives that you're opposed to Senate bill S.506 and House bill HR-1384.

PM

Inside Detroit

BY JIM DUNNE



Tracker Tracked Down



A PM reader spotted these two Suzuki/Chevy Tracker 4x4s on test in North Dakota. He said their interiors looked "quite roomy."

Suzuki will build a small sports/utility vehicle for Chevrolet called the Tracker 4x4 next year. Tracker will be bigger than the tiny Samurai that Suzuki now builds, but smaller than the S-10 Blazer. "It will be bigger and higher priced than Samurai," confides one Suzuki source. "It will also be more car-like inside and in its ride." That sounds like GM all right.

The Tracker will be built in a new plant in Canada. Suzuki is aiming at first production in July of next year. Shortly after Chevy introduces the Tracker, Suzuki will offer its own version, as an addition to the Samurai line.

Bye To Burnouts

Ever get your car stuck in a slippery place where the wheels just spin and the car

doesn't move? It's a common occurrence on icy or muddy roads, and a headache for drivers who get stuck. Sometimes

only a tow truck will get them out. But that problem may be solved if traction control works out.

Auto engineers want to stop that spinning, let you pull right out of the mud. They are developing traction control systems for low-price cars of the 1990s that prevents useless spinning of the wheels. What happens is that sensors in the wheels detect a spin and signal the engine to slow down, so the wheels can get a grip. As the tires slow down and dig in, more power is allowed from the engine.

Then, you can accelerate again without spinning your wheels. As for burnouts—the spinning of tires on high-powered cars that photographers love so much—they will stop too.

What makes traction control so easy to put on cars is the same thing that made anti-lock brakes possible. Sensors that watch the speed of the wheels turning, or not turning, are the key to both systems. Traction control uses the same sensors.

With antilock in place on many cars, it is a relatively simple matter to include traction control. The essential sensors and computers are already on board and just need to be reprogrammed.

Hot Bonneville

Pontiac will change the Bonneville just as it did the 6000 model—that is, make a special version that will offer many of the features you get on sporty sedans. In this case, it's called the Bonneville SSE, a stablemate of the STE. Features on prototypes under test at GM's proving grounds include aero flanges along the bottom of the body sheetmetal, gold-tone finish to wheels and parts of the grille, a spoiler atop the trunk, and what may be a lightweight plastic hood. Features you can't see on the high-performance SSE are a firmer ride, faster steering, all-wheel antilock brakes and probably an all-leather interior.

Fiero Cool Down

After a torrid first three years, Fiero sales have cooled off to a level that is more in line with predictions of the car's popularity. The tiny 2-seater has fallen from an annual sales rate of almost 100,000 to 71,000 last year. This year, it may drop all the way down to the 40,000 sales-rate level.

Reasons for the slide: more competition from CRX, EXP and MR2, plus the natural fall-off of interest from buyers who want the latest things.

Pontiac is fighting back with changes in the Fiero content, and the company already has a new model in the works for 1989. More powerful V6 engines, a better ride, a slicker manual transmission and the availability of air conditioning and automatic transmissions on the cheapest models are content changes. Also, incentives up to \$1200 are being rebated on some models.

Quad Four

Olds' new 2.3-liter Four will be shared with other GM divisions in several strengths. Top-performance version will be a turbocharged, 4-valve design for elite models like the Toronado. A premium motor for the Cutlass, Regal and GP will produce 180 hp without the turbo.

Standard dohc version will make 150 hp for compact cars like the Grand Am. A single-cam version will get the nod for the upcoming Saturn line.

Mazda Mustang

Early next year Mazda will begin production at its new Flat Rock Michigan plant of the so-called Mustang IV, a front-drive sporty car based on the Mazda 626 chassis. Early samples of prototypes of

(Please turn to page 52)



Bonneville SSE sports a plastic hood.

INSIDE DETROIT

(Continued from page 51)

the car have already arrived at Dearborn where Ford is installing its own 2.3- and 2.5-liter 4-cylinder engines.

While Ford and Mazda are secretive about details of the car, some facts are known. The body will be a fastback design with 2-plus-2 seating. Rear-seat passenger room will be tight, even tighter than that of the current Mustang. Tires are Goodyear 15-in. Eagle Plus-4 all-season high-performance models.

This does not mean the end of the current Mustang. Ford plans to continue to build the Mustang GT with its V8 engine and rear-wheel drive into the 1990s as a separate model from the Mazda design.

King Corvette

Still striving for "King of the Hill" recognition among the world's sports cars, Corvette engineers are developing the King Corvette, the quickest, most advanced car Chevrolet has ever produced. The car is being developed in Europe and Detroit with an introduction date set for after 1989. Among its outstanding features are an advanced, no-spring, active suspension developed in conjunction with Lotus, a 6-speed ZF transmission and a superpowerful 4-cam, 32-valve, V8 engine, also

tweaked by Lotus. Displacement is said to remain at 5.7 liters, with as much as 400 hp rumored. Chevy expects that its Corvette will be able to challenge and whip marques like Lamborghini, Porsche and Ferrari.

More Cush For Allante

Cadillac will have a variable suspension system for Allante within a year, if current development targets are met. I spotted a test Allante outside GM's proving grounds in Arizona that was working on the new system. It had a tiny control panel, about the size of a hand calculator, mounted on the center console. On its face were buttons for SPORT, NORMAL, COMFORT and for BRAKE, SPEED.

The three ride settings are easy to understand. But the other two, BRAKE and SPEED, indicate that the system is being set up to make the shock setting firm when brakes are applied or when a certain speed is reached. Not much new here. Imports and Ford have had ride control for a few years now on models that cost far less than the \$50,000-plus Allante. What is new is that Cadillac is planning to add even more goodies for its newest flagship.

Fancy Survey

Leave it to the imports to do things the direct way, without a bunch of commit-

tees and written reports to muck up the system. When Honda wanted to design the trunk on a new model, a market survey was set up to find out just how Americans use their car trunks.

The survey team, all Honda employees, went to Disneyland to gather its information. There—in the parking lots, not at the park—the team watched what kinds of cars Americans were driving, what they put in the trunks and what they unloaded. That information formed a guideline for designing and marketing the trunk of a new car.

It was as simple as that.

Sonic Blasting

Buick will use high technology to assure the water tightness of the Reatta sporty car it plans to introduce early next year. According to Buick, "amplifiers inside the car (on the assembly line) bombard the vehicle with sonic energy." Measurements of energy taken outside the car indicate where the leaks are, if any exist. Reatta will be built under a new version of an old assembly line idea. Cars will stop at each work station in "hiccup" fashion instead of moving past the worker at a steady pace. That never stopping "black devil chain" that runs at every other U.S. assembly line will not be a problem with Reatta builders, who will not have to work on a moving target.

PM

Summer SIZZLER SALE

NORTHERN HYDRAULICS

SAVE 20-50%

Call Toll Free 1-800-533-5545

FREE

For your free catalog, send in the coupon below.



Deluxe Garden Cart
Hauls up to 300 lbs. 40"x25" x14" box carries big loads. Rugged 1/2" plywood, 1" galvanized steel edging. Includes FREE dumpster door. Big 20" wheels. Can ship UPS. 67 lbs.
Item #14521.....\$64.95

Gas Engines
Always the Lowest Prices
And the Largest Selection!
One Year Warranty!

Gas Engines Horizontal

5 HP.....	\$129.95
8 HP.....	\$187.95
10 HP.....	\$219.95

Vertical Engines

8 HP 1"x3 5/32" shaft.....	\$194.95
10 HP 1"x3 5/32" shaft.....	\$219.95

We have a wide variety of horizontal and vertical gas engines available. From 3 to 23 HP in brand names like Tecumseh, Briggs, Honda, Wisconsin Robin, and Kohler.
SUPER LOW DISCOUNT PRICES!

JEPSON

14" Electric Cut-Off Saw

Cuts through 2" bar and 4.6" pipe. Lists for \$259.00. Ship weight 44 lbs.
Item #1552.....**\$136.95**

HOMELITE JACOBSEN

2" Water Pump

Chemical & abrasion resistant seals. Uses 2" suction. Pumps 8,400 GPH with 28 foot lift. 3 Hp. 4-cycle Briggs engine. 5 1/2" x 37 lbs. Lists for \$329.95!
Item #10996.....**\$159.95**



4'x8' Fold-Up Utility Trailer
Easily folds up and rolls out of the way on its casters. Lists for \$349.95. 222 lbs.
Item #1257.....**\$179.95**

For Emergency Power



4000 WATT CONTINUOUS RATED GENERATOR
Ideal for homeowners, farmers, contractors and vacationers! Powered by an 8 Hp Tecumseh engine with cast iron sleeve for extra strength and durability.
Item #16425.....**\$379.95**

4000 WATT Electric Start
Same specs as above but with electric start.
Item #16426.....**\$459.95**

29 Piece High Speed Drill Bit Set



High speed twist drills 1/8" to 1/2" by 64ths. Rugged steel index designed for on the job convenience. (High speed steel!). Ship wt. 3 lbs. Lists for \$65.00!
Item #150291.....**\$14.95**

Shipping & Handling Not Included.

NH Northern

Hydraulics INC.

Dept. #68705

Sale Expires July 31, 1987

Call Toll Free 1-800-533-5545
24 hours a day, 7 days a week!

Send for a **FREE** catalog or send \$6.00 and receive a catalog and Splitter Design book.

Mail to: Northern Hydraulics
PO Box 1219
Burnsville, MN 55337

Name: _____
Address: _____
City: _____
State: _____ Zip: _____

Dept. #68705

MAKE YOUR OWN FURNITURE, WITH HELP FROM

Popular Mechanics



Imagine yourself swaying gently in a new hammock or relaxing with a cool drink in a shaded chaise lounge. Now, put yourself in this picture with PVC Furniture Plans from Popular Mechanics. For an unbeatably low price of \$19.95, we'll send you eight terrific plans:

- patio table and chairs
- hammock
- sling chair
- etagere
- easy chair
- sofa
- chaise lounge
- patio glider

Only

\$19⁹⁵
plus shipping

Your packet will contain a complete set of instructions for each plan, a 12-page "Tips and Techniques" booklet and hints for making comfortable cushions for your PVC furniture.

Why PVC? Not only is it super durable, lightweight and readily available, it's one of the easiest materials to work with. Just cut it with a hacksaw and fasten with PVC adhesive. Painted to a rich glossy shine or left unpainted, your finished piece will look as though a master craftsman created it, even if you've never built furniture before.

To order your PVC Furniture Plans packet containing 8 plans, please send a check or money order for \$21.45 (includes \$1.50 for shipping and handling) to:

Popular Mechanics PVC Plans
Box 1014
Radio City Station
New York, New York 10101

Please allow 3 to 4 weeks for delivery.

We have only 14 technical service vans.



Somewhere out there, a mechanic is installing a spark plug. And doing it wrong. Chances are, though, the plug isn't a Champion.

That's because at Champion, we establish an ongoing, working relationship with the people who sell and install our plugs—to make sure they know how to do it right.

And we do it the hard way—by sending our instructors to garages and service stations around the country, where they turn everyday mechanics into experts on spark plugs and the entire ignition process.

Using mobile laboratories called Technical Service Vans, they accurately simulate engine conditions and the factors that affect spark plug, ignition and engine performance.

Mechanics are taught how to select the proper plug and to determine the

MORE PEOPLE RELY ON CHAMPION THAN

Champion Spark Plugs is a registered trademark of Champion Spark Plugs Company.

Our competition, however, has none.



correct spark-plug heat range for any engine.

They learn how to prevent the potentially disastrous consequences of preignition, detonation and cross fire.

They're even shown how to "read" and interpret the firing ends of spark plugs—which, to the trained eye, are reliable indicators of engine and cylinder conditions.

Of course, you might wonder why other spark plugs manufacturers fail to perform such a vital service.

But when you consider that Champion's superior quality is recognized by the vast majority of car makers—38 of whom choose Champions as original equipment—it's perfectly understandable.

Our competition just doesn't have as much at stake as we do.

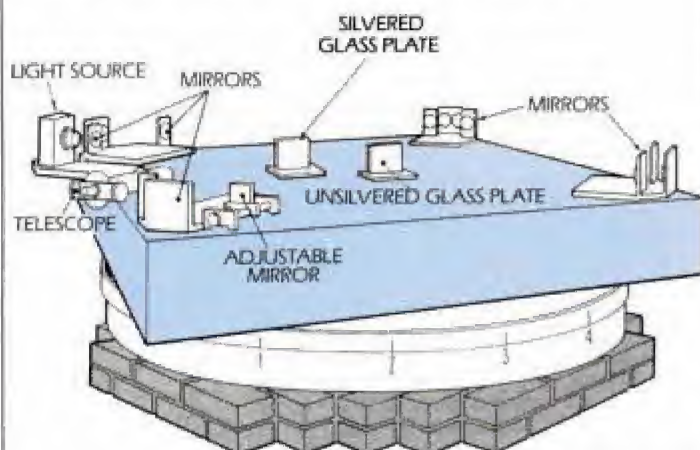
ANY OTHER SPARK PLUG IN THE WORLD.





BY TIM COLE

Physics Centennial



Michelson-Morley experiment used this equipment to split and recombine a beam of light to prove 19th century theories.

Scientists at Case Western Reserve University are arguing that the current era of modern physical science actually began in a Cleveland laboratory 100 years ago. In 1887, the team of Albert A. Michelson and Edward W. Morley set out to prove that the speed of light can be affected by the Earth's passage through space. Instead, the team determined with great precision that light speed is unaffected by the movement of the Earth, debunking 19th century notions of absolute time and paving the way for Einstein's Theory of Relativity. Fittingly, the Michelson-Morley experiment began with the splitting and recombining of beams of light, an exercise that illuminated not just the fundamental laws of nature, but lighted a path for future generations of scientists



around the world.

Academicians at Case Western Reserve, where the Michelson-Morley experiment was conducted, say the work not only led to the development of modern physics—which in turn resulted in such contemporary disciplines as nuclear engineering, solid-state electronics and magnetic resonance imaging—but also resulted in profound changes in philosophy and the arts. By overturning popular theories of the universe, the Michelson-Morley experiment seemed to sanction a spirit of inquiry that transcended science and touched the broad spectrum of cultural and political life.

According to Philip Taylor, professor of physics at CWRU and originator of the

Michelson-Morley Centennial, the experiment was confusing to the scientific community at the time because the results were exactly opposite from what the experiment was designed to prove. Nineteenth century physicists were convinced that light was a wave phenomenon that traveled through a medium known as ether, which filled all of space. It was thought that the speed of light would change with changes in this medium, much the same way a boat's speed is affected by changes in the speed and direction of a river's current. It was assumed that the Earth's orbit around the sun disturbed the omnipresent ether, affecting light in much the same way.

Michelson, a physicist, and Morley, a chemist, set out to prove the theory by building an interferometer—an instrument (see illustration) that makes precise measurements by means of the interference of light-wave patterns. They split a single beam of light into two beams that traveled at right angles to each other. The beams were reflected back and forth through a series of mirrors for a precise distance of 36 ft. and then recombined to be visible through an eyepiece.

It was expected that the light would travel at different speeds and reach an observer at different times. The research team also knew that the recombined beams would produce bright and dark bands called interference fringes; bright bands were areas where light arrived in phase, dark fringes where light arrived out of phase. If the divided beams were traveling at different speeds in different directions—and if the beams were influenced by ether—they expected to see shifts in these interference fringes.

The pair could see no such shifts, even when the interferometer was rotated. The discovery raised sobering questions about the absolute nature of time and led to the Theory of Relativity, which states that all motion must be defined relative to the ob-

server's frame of reference.

Pondering the Michelson-Morley achievement is interesting and valuable as this century ends and another begins. A hundred years from now we may be commemorating scientists who have discovered the essential particle of matter, an event that may be realized soon when the Superconducting Super Collider comes on line.

Super Collider Site Selection

It will be the biggest particle accelerator on Earth, capable of speeding protons close to the speed of light before they collide and release the energy of 40 trillion electron volts. Dubbed the Superconducting Super Collider, this mammoth machine will yield new insight into the fundamental particles of nature. Where to place this huge scientific experiment—estimated cost \$4.5 billion—is currently under study by the Department of Energy. The DOE deadline for site advocates is early August, and states, counties and municipalities are lining up to offer free land—as mandated by the federal government—in exchange for the tremendous economic energy the Super Collider is expected to generate. Watch for updates on America's quest to lead the world in this important area of particle physics research—along with a major look at how the Super Collider may change our lives.

Space Station Will Be Revamped

The final configuration for America's planned Space Station is still up in the air. The cost of the original dual-keel version was expected to approach \$15 billion, up from NASA's original \$8 billion estimate of just 12 months ago. But Reagan Administration officials recently reached an accord that would allow NASA to proceed with the first phase of the Space Station, a scaled-back \$12.2 billion manned orbiting platform consisting of a main truss,

(Please turn to page 58)

**“THERE'S NO WAY I'd let her
wait for a cab in that kind of storm.
And there's no way I'd ever give up
what we talked about in that car.”**



Buckle up—together we can save lives.

LINCOLN-MERCURY DIVISION 

**THE 68
standard features of
new MERCURY
TRACER. Because
the best friends are
the ones that go out of
their way for you.**

- Electronic fuel-injection
- Front-wheel drive
- 5-sp. manual transaxle
- All-weather steel-belted radial tires
- Power front disc brakes
- Four-wheel independent suspension
- Front MacPherson struts
- Rack-and-pinion steering
- Tachometer and analog gauges
- AM/FM four-speaker stereo system
- Digital clock
- Dual power remote-control mirrors
- 3-speed wipers with pause feature
- Side window demisters
- Reclining all-cloth

- front bucket seats
- Driver's-side lumbar support
- Adjustable back-angle rear seats with headrests
- 50/50 split-fold rear seat
- Rear seat heat ducts
- Rear window defroster
- Illuminated Entry System: lighted keyhole and ignition
- Reminder tones for ignition, headlamps-on and seat belts
- Diagnostic alert system for stop lamps, fuel and washer fluid
- 16-oz. cut-pile carpeting
- Seat-back and door-panel map pockets
- Passenger-side under-seat storage tray
- Removable cargo-area storage tray
- Remote fuel door release
- Remote hatchback release

- Tinted glass
- Aerodynamic halogen headlamps
- Flash-to-pass headlamp feature
- High-mounted stoplamp
- Urethane lower body-side protection
- And 34 other standard features.

For more information call
1 800 822-9292



MERCURY

The shape you want to be in.

To buy or lease, see your Lincoln-Mercury dealer.

Now you can fix your own broken concrete with **QUIKRETE®** SUPER-STRENGTH Vinyl Patcher



Just add water.

Make your own repairs to concrete steps, floors, walks. Resurface concrete driveways. Many other uses. Just add water and apply. \$2. rebate on 40-lb. bag, 50 cents on 7-lb. pail June 15 to August 15, 1987, at participating dealers.

\$2
REBATE
on 40-lb. bag

There are special QUIKRETE® products for nearly any concrete building or repair project.



Order this new 165-page hardback that tells you all you need to know to build and repair with concrete.

Complete dozens of projects from making simple sidewalk repairs to

building a foundation or

wall. Detailed illustrations — photographs, drawings and diagrams — lead you step by step. All necessary tools and materials are listed. Available, at your home center, hardware or building supply. Or send \$7.95 to QUIKRETE®, RD 1, Box 276, New Ringold, PA 17960.



The QUIKRETE® Companies, Atlanta, GA 30345

SCIENCE

(Continued from page 56)

four 45-ft.-long pressurized modules, and a solar-array power system. Phase two would include upper- and lower-station booms, a servicing facility and a co-orbiting platform for undisturbed processing of materials in microgravity. The 2-step Space Station design comes amid at least one call from the scientific community for an early lofting of a single, large module with numerous docking ports.

Scientist Peter Banks, chairman of NASA's Task Force on the Scientific Uses of Space Station, cites a critical need for early deployment of a less expensive Space Station that will not sacrifice funding for other scientific work. NASA officials say America will be disserved with an outdated station design that could perform little more than the Soviet Union is achieving now with Mir, their own orbiting platform.

The dissension and foot-dragging is one more unfortunate byproduct from the Challenger catastrophe 18 months ago. To make matters worse, the next shuttle launch will probably be pushed back from February 1988, to August or September 1988.

Indeed, knowledgeable observers now allude to America's "launch crisis," particularly in view of the April loss of a communications satellite aboard an Atlas/Centaur rocket that lifted off in a lightning storm. NASA insists the launch was ordered under proper weather criteria, a notion that has been scoffed at by aerospace professionals.

The McDonnell Douglas Medium Lift Vehicle (based on the venerable Delta expendable launcher) and NASA's forthcoming design for a Heavy Lift Vehicle will go a long way toward re-establishing America as a space power. But the prospect looms of having the U.S. rely on other national space agencies to launch critical navigation, weather and military payloads. Numerous Navstar and Landsat satellites are waiting to be launched, and the military's KH-11 (and supersecret KH-12) reconnaissance satellites need to be augmented as soon as possible.

So, under the unfortunate possibility that the United States must go shopping for launch services, what's available on the open market? Of course, the European Space Agency has enjoyed significant success with the Ariane system, and the Japanese are making real strides with their launch vehicles. But don't discount The People's Republic of China, which will soon market the Chang Zheng 3, Long March 1 and Long March 2 rockets. The Soviet Union is also making overtures to firms seeking launch platforms for satellites.

And you thought the race for space

ended when Neil Armstrong strolled the lunar surface in 1969.

More Embassy Woes

The National Bureau of Standards, the arm of the U.S. Department of Commerce that monitors and measures various types of industrial materials and designs, recently concluded that Soviet eavesdropping devices aren't all we have to worry about with our embassy in Moscow. NBS reports the building has "important structural deficiencies" outside the bugs embedded in the building's beams, including poor joints in reinforced concrete columns and walls that lack sufficient strength because of hollows—they aren't completely filled with concrete.

NBS investigators also found cracks in a rooftop parapet and recommended measures be taken against "progressive collapse," which occurs when the failure of a single supporting structure leads to a wider failure. The NBS team concluded that remedial measures would cost \$1.5 million but would not entail major reconstruction—if the building were located in Washington, D.C. There's no telling how the U.S. State Department intends to handle this threat to the safety of our personnel.

Mapping The Sea Floor

President Reagan established America's Exclusive Economic Zone (EEZ) in 1983, giving the U.S. jurisdiction over seabed resources extending 200 miles offshore. The EEZ encompasses more than 3.4 million square miles and effectively doubles the target area for future retrieval of energy and mineral resources. The Department of Interior's U.S. Geological Survey recently started surveying this huge area using the GLORIA (Geological Long Range Inclined Asdic) side-scanning sonar system, discovering important new features of the sea bottom adjacent to our shores.

Installed aboard the British research vessel Farnella, GLORIA is capable of scanning a swath 60 kilometers wide, covering up to 20,000 square kilometers a day at a speed of 8 knots. Farnella found undersea canyons that cut thousands of feet deep across the ocean floor for more than 100 miles. Researchers also discovered that some canyons are oriented less perpendicular to the coastline than previously thought.

In addition, the Farnella crew discovered tremendous undersea landslides 25 miles across, giving new insight into the incredible dynamics of the ocean floor. Farnella continues to map several segments of the EEZ and is scheduled to map the EEZ off Hawaii and Alaska this summer.

PM

hearing help for

Nerve Deafness

If you hear, but don't always understand the words, Miracle-Ear® may be your answer.

Miracle-Ear can help many people overcome problems like hearing only parts of words . . . straining to hear . . . asking others to repeat . . . or becoming confused when spoken to. These are classic symptoms of nerve deafness.

If you've been told a hearing aid won't help, now there's Miracle-Ear®.

Miracle-Ear canal aid is a comfortable "custom-fit" hearing instrument designed to help nerve deafness. Notice how small it is compared to other hearing aids you may have seen; it is so small, almost unnoticeable.

Find out if Miracle-Ear® is right for you.

Of course, not everyone can be helped with a hearing aid, but many can. To learn more about Miracle-Ear, complete the postage paid card and mail today.



*Mail the
postage-paid
card Today!*



Miracle-Ear®

SMART AUTO ADVICE

The #1 way to smooth your rough-running engine.



A dirty fuel system can cause some funny things to happen to your car. Like poor gas mileage. Stalling. Slow pick-up. Poor idling. Things that make you think you need a costly tune-up. And that's anything but funny.

So before you think tune-up—think Gumout®. The #1 selling Carburetor & Fuel Injector Cleaner in America.

Gumout is one powerful detergent gasoline additive, yet it won't harm catalytic converters or oxygen sensors. And just one bottle in your gas tank—just once a month—will keep your fuel system clean. Remove harmful moisture and contaminants that accumulate in your gas tank. Cut through and dissolve deposits of dirt and gum from your carburetor. Help keep fuel injectors from fouling. Help keep intake valves, ports, manifolds, and PCV valves performing right. Turn your hard starts into easier ones. Help prevent stalling. And, make your rough-running engine run a lot smoother.

Gumout's so effective, it'll work on any age car—with any type gasoline. There's even a tested-tough Gumout Diesel Fuel System Cleaner. It's ideal for cold weather driving conditions. And it'll clean your diesel system like new.

If you think you need a tune-up, think Gumout first. For better starts, better gas mileage, better highway performance, and a smoother-running engine.

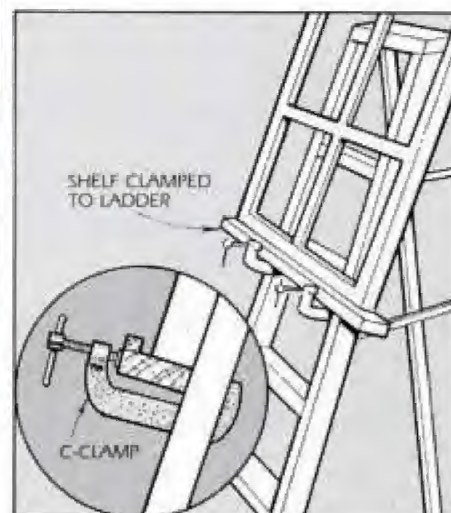
GUMOUT. The Between Tune-Ups Tune-Up.
AMERICA'S #1 BEST SELLER.

Quality Products of the Pennzoil Products Company.



HINTS FROM READERS

Painting Easel



Next time you need an easel for painting windows, shutters or any other large, flat object, you'll probably find it in your garage. All that's needed is your step ladder and two C-clamps. Simply place the clamps at the desired height and rest your work on them. The clamp handle even serves as a paint-can hanger. For more versatility, clamp a board or L-shaped ledge to the ladder as shown. This enables you to handle objects smaller than the leg span.

—L. Small

Square Gauge

Use your steel square as a gauge for positioning drawer handles or other hardware. Make two blocks about $1\frac{1}{4}$ in. x $2\frac{1}{2}$ in. that slide over the arms of the square. You can make these blocks by cutting a slot in $\frac{3}{4}$ -in. stock, or by piecing together $\frac{1}{4}$ -in. stock with a spacer the thickness of your square in between. A bolt and wingnut secures the stops. Now you can mark preset distances in from both edges of your work. —Walter E. Burton



OVER 20,000 SOLD!

New Stitch Welder Tames Sheetmetal Distortion



Our Customers Write:

"Before buying your Stitch Welder I was ready to throw my electric welder in the trash. No matter how hard I tried, the amps could not be set low enough to prevent burning holes in the sheetmetal. I now have a usable piece of equipment thanks to your Stitch Welder."

J. Wright, Penna.

Simplifies Home Bodywork

With a little practice anyone can weld automotive sheetmetal with virtually no distortion or burn-through. The Stitch Welder makes it easy to run a continuous weld bead on quarter panels, body patches, floor boards, etc. If you've ever tried arc welding body panels you know the high amperage output plays havoc on thin gauge metal. Our new Stitch Welder controls amperage to produce professional, uniform welds similar to those made by expensive wire-fed MIG machines.

Special Circuits Control Arc Welding

By directing the arc welder's current through a copper wound solenoid and diode the Stitch Welder creates a unique pulsing action. This pulsed current produces an easy-to-control arc necessary for clean, uniform weld beads on sheetmetal. There are no buttons or triggers — the pulsing action is automatic! All you do is guide the electrode.

Welding with the Stitch Welder is faster and easier than conventional stick welding. The arc's self-starting, so there's less chance of rod sticking. Once you strike an arc lay the rod on the metal and let the machine do the work. After some practice you'll produce welds requiring little grinding or filling. Remember, as with any welding tool the Stitch Welder requires practice to produce good results. We've included complete detailed instructions.

Attaches to Any A.C. Welder

The Stitch Welder's five-foot power cord attaches to the electrode holder on any A.C. arc welder (must run at 80 amps or less). Uses standard arc welding rods up to 3/32" and will weld down to 22 gauge steel and stainless. The tool body is cast aluminum with a vinyl insulated grip for positive control. Electrodes held with a set screw and can be easily replaced. Tool designed for years of trouble-free service. ALWAYS USE PROPER SAFETY PRECAUTIONS WITH ANY WELDING EQUIPMENT.

30 Day Shop Trial

Try the Stitch Welder for 30 days in your shop or garage. If you are not completely satisfied, simply return it for a full refund. Order your Stitch Welder now for a head start on body work projects. The Stitch Welder is only \$59.00 plus shipping. Available only through Eastwood.

**TO ORDER CALL TOLL FREE:
1-800-345-1178**

For fastest service call toll-free 1-800-345-1178 (in PA, 215-644-4412) and charge your Stitch Welder to Visa, MasterCard, or C.O.D. (\$2.75 additional fee on C.O.D.) Mail orders use coupon.

© Copyright 1985 The Easthill Group



*Featured in
Hot Rod,
February, 1986*

Eastwood

CODE 1D37PM77

- ☐ Send me _____ #4369 Stitch Welders at \$59.00 plus \$4.95 shipping & handling
- ☐ #4372 Arc Welding Rods Designed for Sheetmetal. 2mm dia., special flux, 3 lb. pkg (approx. 120 rods) — \$9.95
- ☐ Send Free 80 Page Tool Catalog
- ☐ Check Enclosed ☐ C.O.D. (\$2.75)
- ☐ VISA ☐ MasterCard

Card # _____

Expiration Date _____

Name _____

Address _____

City _____

State _____ Zip _____

Pa. Residents, Add 6% Sales Tax

The Eastwood Company
147 Pennsylvania Avenue
Box 296
Malvern, PA 19355

NEW/HOME

Plug-In Home Security



Keepsafer Plus package comes with a programmable control console, three transmitters/sensors and a handheld remote control.

Keepsafer is an easy-to-install, wireless home security system. Simply screw the transmitters/sensors (T/S) to a window or door and plug the control console into an outlet. When the window or door is opened, the T/S signals the console which, in turn, sounds an alarm. The basic system (\$179) has a control console and two T/S. Additional T/S cost about \$25. Keepsafer Plus (\$349) comes with an expanded control console,

three T/S sets and a remote control. Some options include a smoke alarm, emergency autodialer, medical alarm, glass-break detector and an infrared motion detector. For more information, contact Schlage, 2401 Bayshore Blvd., San Francisco, CA 94134.



Two of the many accessories available include a glass-break detector (left) and an automatic phone dialer (above). In case of a break-in, dialer calls a central dispatch station that, in turn, calls emergency numbers.



Dual-Exhaust Window Fan

Keep cool with this portable 2-speed window fan that converts easily to a free-standing floor model. The unit features two 8-in.-dia. fans that reverse direction to blow in fresh air or exhaust stale room air. The fan is 10 $\frac{3}{4}$ in. high and fits windows ranging between 24 in. and 35 $\frac{1}{2}$ in. wide. Extenders are available for use in wider windows. An adapter permits use in case-

ment and awning windows.

At low speed, the fan operates at 1500 rpm; and air output of 675 cfm. High speed (2000 rpm) circulates 900 cfm of air. The fan (model No. 2000) has a steel frame with a durable plastic grill that guards children's fingers. It's \$50 at hardware and department stores. Contact W.B. Marvin Manufacturing, Box 230, Urbana, OH 43078.

Decked Out

Make an old, wood deck look like new again with Wolman's Deck Brightener. Deck Brightener is formulated to remove dirt, mildew and algae from pressure-treated and untreated wood. Simply mix it with water and apply the solution to the deck with a sprayer, mop, brush or roller.

Allow the solution to stand for about 10 minutes, rinse the deck with water, and then brush it off with a stiff-bristle broom. Wait until the deck has dried thoroughly before applying a water repellent or stain. One 6.4-ounce packet costs about \$8. Contact Becky Guy, Wolman Protection Products—PM, 1050 Koppers Bldg., Pittsburgh, PA 15219.



Easy-to-apply cleaner is formulated to remove dirt, mildew and algae from wood without using harmful acids or chlorine.



Mix one 6.4-ounce packet in 1 gallon of water. This will provide 150 sq. ft. of coverage.

Keeping Cool And Quiet

A new type of room air conditioner developed by United Technologies offers an alternative to conventional cooling units. A split-system air conditioner consists of an indoor unit, that can be mounted to the wall or ceiling, and an outdoor unit that houses the compressor. A 2 $\frac{3}{4}$ -in.-dia. hole through the wall connects the units. They come in three sizes: 1-ton, 11,600 BTU (\$1250); and 1 $\frac{1}{2}$ -ton,

18,000 BTU (\$1750); and 2-ton, 22,600 BTU (\$2250). It's sold through Bryant, Carrier, Payne, and Day & Night dealers. **PM**



Split-system air conditioner has a wood-grain indoor unit and an outdoor unit that houses compressor.



The 8 $\frac{1}{2}$ -pound window fan has a pop-up carrying handle and swing-out feet that convert the unit to a free-standing floor fan.



PICTURE YOURSELF

**with a little less gray,
a lot less, or none at all.**

All over the country, there's a group of men—actually millions of them—who have a secret they don't share with anyone. Not even with each other.

Their secret? That nobody knows they're using Grecian® Formula 16® to gradually take away as much gray—or as little as they want to lose, without anybody knowing. That's their secret.

They do it with a clear liquid, as easy to use as a hair tonic. Here on this page you can see the undoctored photographs of the hair taken day-by-day as one of these Grecian users gradually took care of that older look.

Note in the photos around the page how the change each day seems like no change at all. But compare #1 (when he began) with #18. The nearly invisible day-to-day changes have eliminated the gray and created a younger looking man.

You can do it too. Not necessarily the way this Grecian user did. You may have more or less gray to start with. And you may want to end up with more—or less. You're in control. A lot of Grecian users leave a little gray on the sides.

The important thing is that you look perfectly natural all the time. The return of your own natural looking color each day over a period of weeks is so imperceptible, not even your friends can tell you're using Grecian. Unless, of course, you tell them yourself.

You'll be glad to know you won't have trouble finding Grecian. It's available wherever men's toiletries are sold. That's because millions of men quietly demand it.

Free trial offer. For a trial package send \$1.00 for postage and handling to Grecian, P.O. Box 9936, Maple Plain, MN 55348. Specify liquid or cream. Limit one per family. Offer ends 9/30/87.

GRECIAN® FORMULA 16®



NEW/AUTO

Two-Way Tester



Our Saturday mechanic is always using this trusty vacuum pump to chase down leaky or failed widgets in that maze of underhood emissions controls. This 2-in-1 gauge allows you to test both vacuum and pressure by just moving the hose from one gauge connector to another. As a vacuum pump, use it to test the EGR valve, the power brake booster, the distributor vacuum advance, and the thermal air cleaner intake valve. This type of pump is essential for diagnosing problems in late model cars. The pump is also great for vacu-

um-controlled A/C controls and door locks. On the pressure side, it will develop 30 psi for checking emissions devices, leaky cooling systems or window washer hoses. This vacuum pump is priced at \$79.95 in auto parts stores, or you can order it (part No. BT 8624) directly from the manufacturer. Write to Borroughs Division, Sealed Power Corp., Kalamazoo, MI 49007; or call toll-free (800)253-0138.

Make My Day—If You Can

CarLock is designed to slip over the center-mounted handbrake handle, and to lock firmly against the gearshift handle, whether your car has an automatic or manual. Easy

to use, it installs or removes in seconds and stores easily in the glovebox or under the seat. This leaves your car in Park, or in gear, with the handbrake firmly applied. Its hardened steel construction, shrouding the lock cylinder, makes it virtually cut- and pick-proof. On cars with gear shifts close to the dashboard, CarLock can block the radio from being removed as well. Bright red in color, it's attention-grabbing enough that it should make thieves move on to the next car before they attempt a break-in. It's \$39.95 plus \$3 shipping from Bluepoint Industries, Chalfont, PA 18914; (800)553-2345.



Bright red color makes CarLock stand out, deter thieves before break-in, not after.

Hydraulic Lifter Removing Tool

Snap-On's hydraulic lifter tool pulls gummed up lifters out of engines by using a sliding hammer and an internally expanding collet. The expanding collet grips the inside of the lifter, and if it won't pull out easily, then a tap with the integral slide hammer will pop it free of the rim of sludge keeping it in. You'll have to find a store that carries the Snap-On line, or order from Snap-On salesman. Ask for Tool No. S-8692; it costs \$47.25.



Twist T-handle to grip lifter with expanding collet, then pull out.

Collet (right) grips lifter.



Rust or pinholes don't have to mean replacing fuel tank.

Save Gas

Eastwood's catalog of tools and supplies for the car restorer includes this elastomeric coating for the inside of leaky or rusty fuel tanks. First, you might need to use Eastwood's \$8.95 etching solution to chemically clean up the rust. Then slosh the sealer around to coat the inside of the tank. It's also claimed to be safe if you use gasohol or octane boosters. It costs \$16.50 for a quart, which should just be enough for most cars, and \$40 for a gallon. For a free catalog, contact the Eastwood Co., Box 296-M, Malvern, PA 19355; (215)644-4412.

Light At The End Of The Tunnel

Tired of working on your car with a flashlight held in your teeth? Or burning your nose on the lamp in your dropcord? This 30-watt lantern's cool, diffuse light is perfect for working in or under your car. Unlike that flashlight's pencil beam, you can see things that aren't right in the beam. Rechargeable batteries provide hours of use, or just plug it into the wall or lighter socket. The lantern is available in hardware and do-it-yourself stores, or send \$82.95 plus \$5.50 for postage to Romar Enterprises, P.O. Box 42340, Las Vegas, NV 89116. **PM**



Fluorescent light recharges from 110- or 12-volt sources.

CAMEL LIGHTS

Share a new adventure.



9 mg. "tar", 0.6 mg. nicotine av. per cigarette by FTC method.

SURGEON GENERAL'S WARNING: Smoking Causes Lung Cancer, Heart Disease, Emphysema, And May Complicate Pregnancy.



**“I’M AN EASY GUY TO SATISFY.
I ONLY WANT THE BEST.”**

**INTRODUCING SIERRA:
THE ULTIMATE PICKUP
FROM GMC TRUCK.**

You demand a lot of your possessions.

To fit your life, a vehicle must do more than simply fit in your driveway. Now there’s a truck to meet your highest expectations — and exceed them: Sierra. The ultimate pickup from GMC Truck.

Sierra’s aerodynamics give it a contemporary profile, with a rakish windshield and flush-fitting side glass. With sophisticated styling, it’s designed to be the full-size pickup that can go everywhere. Select a four-wheel-drive model

(with the Insta-Trac system that lets you shift conveniently from two-wheel to four-wheel drive without stopping), and “everywhere” can be almost anywhere!

Full-size and all-new.

Sierra features a new standard rear-wheel anti-lock brake system (operable only in the two-wheel-drive mode on four-wheel-drive models) to help prevent rear-wheel lockup during braking, whether your Sierra is empty or loaded. The fuel tank is mounted between the frame rails. The majority of the exposed metal surfaces on Sierra are galvanized steel, covered by deep-luster basecoat/clearcoat acrylic enamel — the same advanced painting technique that

protects some of the world’s finest automobiles.

Full-size inside... and outside.

Sierra is still a full-size truck in the great GMC Truck tradition. Its handsomely appointed interior features room for three adults — and even more shoulder and leg room than previous full-size pickups from GMC Truck. There’s a choice of 6½’ short-bed or 8’ long-bed models. And the spacious long-bed can still accommodate the proverbial 4’ x 8’ sheet of plywood between the wheelhousings.

Full-size power.

The amazing 4.3-liter Vortec V-6 engine is standard (except on 3500 models which feature a standard 5.7-liter V-8), and imbues



Sierra with both power and economy. In fact, with the available five-speed manual overdrive transmission and Vortec engine, a two-wheel-drive Sierra is rated at an impressive EPA estimated MPG city 17 and highway 23. Or you can have your choice of available V-8s, including the powerful 7.4-liter (454 cu in) or the 6.2-liter (379 cu in) diesel. Electronic fuel injection, standard on every gasoline engine, offers instant starting response and outstanding over-the-road performance — all the power you need for full-size jobs, like towing. In fact, when properly equipped, Sierra can move up to 19,000 lbs, including itself, passengers, trailer, equipment and cargo.

You'll find that Sierra is built to be driven, thanks to a new fully independent torsion bar front suspension on 4 X 4 models or a newly improved two-wheel-drive front suspension. When you take the wheel, you'll be driving a full-size pickup with handling as advanced as its looks.



And Sierra has a warranty to match. Every new Sierra has a 6-year/60,000-mile warranty on the powertrain and a 6-year/100,000-mile warranty on outer-body rust-through. See your dealer for the terms and conditions of this

limited warranty.

Built to pass your toughest test.

If you're satisfied with only the best in life, buckle up and visit your GMC Truck dealer for a look at the new Sierra. (You'll find a listing in the Yellow Pages, under "Truck" or "Automobile.")

See the new Sierra for yourself. It's everything you expect from a GMC truck. And like nothing you've ever expected in a full-size pickup.

Unless, of course, you expect only the best.

GMC TRUCK
IT'S NOT JUST A TRUCK
ANYMORE.

Car Clinic



BY MORT SCHULTZ

Divide And Conquer

The engine conks out every time I turn the power steering wheel of my 1981 Mercury Cougar to the left or right stop while the car is at a standstill. The drive belt is in good shape, and its adjustment is right on the money. So tell me—why is this happening?

JOE NUZZOLO
VALLEY STREAM, NY

There are two possible reasons: (1) Engine idling speed is too low; therefore, when you turn the steering wheel to one stop, engine speed can't keep up with power-steering pump demand, rpm drops and the engine stalls. (2) The power-steering, high-pressure relief valve is stuck.

The job of the high-pressure relief valve is to let the pump build up to a specific pressure (600 psi, for example) as the steering wheel is turned. When pressure reaches that point, the valve is supposed to open and allow pressure to bleed off. If the valve sticks, pressure will build up beyond the allowable point. The demand by the pump for greater power overloads the engine, and it will stall.

Adjust engine's slow-idle speed to spec; then, test high-pressure relief valve.

Tow Strap Warning

This warning is straight from the U.S. Department of Transportation: If you bought elastic or nylon tow straps, because they were advertised as being helpful

in getting a vehicle out of snow and mud, watch out!

The U.S. Department of Transportation says, "Many manufacturers' directions are either incorrect or unclear. For example, elastic or nylon tow straps should always be attached to the frame of a vehicle—never to the bumper or to a ball hitch."

Directions that say to leave slack in the line so the driver of the pulling vehicle can accelerate rapidly to jerk a stuck vehicle free are dead wrong. The tow strap can act like a sling shot, pulling the bumper or ball hitch free and flinging it at the tow vehicle.

Is DOT overreacting? So far seven accidents involving these straps have resulted in four deaths and three injuries.

Plymouth 'Canary'

Since new, my 1984 Plymouth Reliant had been whistling while it worked—a loud canary-like twitter that seemed to come from the right-front corner. The noise defied all efforts to identify its source, and I took little comfort in hearing the same sound from other 1981-'84 K-cars as I walked the streets.

Then, one day I got lucky. With my car parked pointing into a stiff wind, I heard the noise and traced it to a side-marker light lens. As air passed between the lens and bezel, it made the annoying sound. A bead of silicone sealer stopped the whistle once and for all. Maybe others can use this information.

DR. ELIHU N. SAVAD
WESTFIELD, NJ

Battle Of Wits

I bought a 1986 Pontiac Grand Am from a used-car dealer. Soon after, the paint along the lower part of the body began flaking. The dealer said it's not his responsibility and suggested I see if Pontiac will stand the cost of repair under the terms of the new-car, 3-year, rust-through warranty. The Pontiac dealer says that since I'm the second owner I'm out of luck... besides, flaking paint is not rust-through. Should I give up?

GARY ROSENBERG
WEST PALM BEACH, FL

The paint condition and its repair are subjects of a Pontiac-instituted recall. Refer the Pontiac dealer to Dealer Service Management Bulletin 86-SM-22; then if he has a question, he should get in touch with the Pontiac field or zone office.

On some models built in the Lansing plant, adhesion between the chip-resistant primer and the basecoat/clearcoat surface was less than adequate because of an error in the painting procedure. Pontiac will pay for refinishing cars that have flaked or chipped paint. The offer is in effect for three years from the date a car was placed in service, regardless of mileage—this means three years from the day the first owner drove it from the showroom.

The policy extends to subsequent owners of a vehicle for the full 3-year period. When the dealer does the work, the basecoat/clearcoat surface has to be removed, hopefully without disturbing the chip-resistant primer, so a new basecoat/clearcoat coating can be applied.

Search For Lurch

Can it be true that I must put up with a low-speed lurch just before I brake my 1986 Taurus to a stop? The car is equipped with an automatic overdrive (AXOD) transaxle.

This is what the Ford deal-

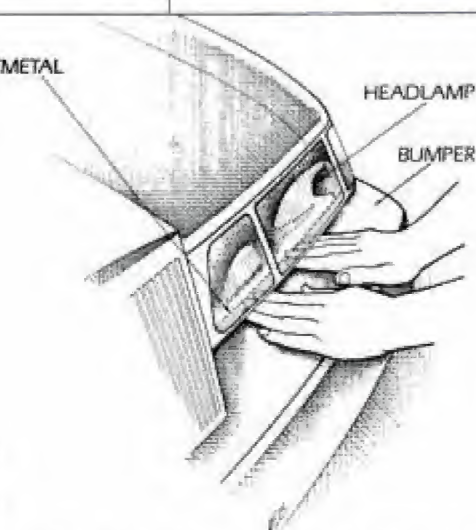
(Please turn to page 74)



Rattle Traps

Buzzes and rattles are usually easy to fix, but tough to find. So this tip may help.

If you hear a buzz or rattle from the front of your car, don't overlook the headlights. One or both may be touching the sheetmetal lying just below the lamps. This could be causing that vibration-type noise you're hearing. Slip



your fingers under each headlight and press the strip down until there's a little clearance between the light and strip.



Your team will be responsible for transforming a spot of wilderness into a satellite communications station. One capable of sending and receiving messages anywhere in the world. If you qualify, you'll be trained to work with microprocessors, troposcatter and microwave communications equipment, single- and multi-channel systems, and more. High tech doesn't get much higher than this.

ARMY. BE ALL YOU CAN BE.

WE PUT OUR FINGER ON THE PROBLEM:
SLUDGE FROM CONVENTIONAL MOTOR OILS.





AND CAME UP WITH THE SOLUTION:
NEW QUAKER STATE WITH QSX
KEEPS ENGINES CLEANER TO LAST LONGER.

These photos tell the story. The rocker arm cover on the left comes from an engine that used conventional motor oil. That kind of sludge buildup can be murder on your engine.

The rocker arm cover on the right is from an engine that used New Quaker State with QSX. Our amazing new QSX formula works by keeping deposit-

forming combustion by-products suspended in oil, so they can be filtered and removed without collecting on vital engine parts. Regular oil changes with New Improved Quaker State can actually extend the life of your engine.

So reach for superior engine protection—New Quaker State with QSX.

REACHING FOR THE BEST.



Don't miss the Quaker State 500 at Pocono Raceway on August 16, 1987. For information and tickets call 1-800-RACEWAY or (717) 646-2300.

CAR CLINIC

(Continued from page 70)

er told me. He says there's nothing wrong with the brakes, and that I'd better get used to it, because that's the way things are, which is hard to believe.

ART NOBLE
SPRINGFIELD, MO

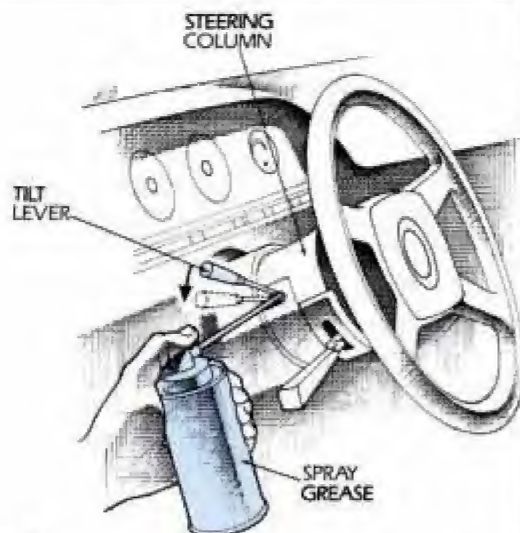
Believe it. If there's no mechanical malfunction, then this is indeed the case. What you call a lurch, Ford calls a harsh driveline bump or jerk. Some owners of 1986 and 1987 Taurus and Sable models are getting this sensation, like you, just before coming to a complete stop; others are also getting it while alternately coasting and lightly accelerating at speeds under 15 mph. Ford says the condition results from power train lash (movement, that is) because of the way the power train is calibrated. It doesn't appear as if lash has any long-term harmful effect.

On the slim chance that a malfunction in the brake system is causing the lurch, bump or jerk—however you want to describe it—you may want to have another dealer or a Ford factory field representative test the car. But don't let anyone try eliminating lash by resetting engine idle speed or read-

justing the throttle valve (TV) cable. It won't work and may create a problem you don't have now.

Tiring Effort

I have a 1984 Honda Accord. Ever since it passed the 5000-mile mark, it has had



Bilt To Tilt Quietly

No lube chart I know of says to give the tilt-steering a shot of grease. But forget the lube chart. If greasing gets rid of the squeaking noise you heard as you turn the wheel when it's in a tilted position, then grease away! Bring the wheel to its full-up position. Squirt some grease into the tilt-release lever housing, so the U-joint is treated. Use

Lubriplate Spray-Lube or something equivalent. As you apply grease, turn the steering wheel from stop to stop once. Then, hold the tilt lever in the release position and move the steering wheel from it's Full Up to Full Down position about 8 times. If the squeak persists, give it another treatment.

Essential Tools For Your Garage.

You know the value of having the right tools for the job at hand.

Easy-to-use, easy-on-the-pocketbook Berryman products are your blueprint for maximum performance.

Berryman's powerful BRAKE CLEANER removes brake fluid, grease and oil from disc brake pads, linings and other related parts . . . on all brake jobs large or small. Plus it stops brake squeal.

No shop is complete without it. Berryman products are guaranteed. So ask for them wherever you shop for parts.



Guaranteed Quality Since 1918
3800 E. Randol Mill Rd
Arlington, Texas 76011



a tendency to drift to the left. It isn't bad, like a pull, but I can't take my hands off the steering wheel and have the car track straight. The car has now been driven more than 30,000 miles. To try and resolve the condition, tires have been balanced and rotated; the front end has been checked for worn parts (there are none) and has been aligned; brakes have been inspected (there is no sign of damage or worn parts). Is there a solution?

JOE WALLWORK
NEW YORK, NY

Maybe. Although there will be a slight drift with most vehicles if you don't keep your hands on the steering wheel, let's assume that you're experiencing an abnormal drift. Alignment settings are fussy; be sure they are not only within spec, but symmetrical from side-to-side. Based on your descrip-

tion, I must also assume that nothing mechanically wrong with your Honda is causing the drift. Then, the likely place to look for a reason is with the tires.

A likely cause is a condition I call "ply-steer syndrome" that affects some models. If this condition is present, the tires have a tendency to cause the car to steer in the direction of the plies, resulting in drifting. Had you been aware of this before, you may have gotten a new set of tires from the tire company (as your tire warranty states, tires on a new car are the responsibility of the tire company

—not the car manufacturer).

At this point, the only thing you can do is relate the history of the condition to a dealer of the particular brand of tires. If he's a good guy, he may take the case to the company, which can decide if you're entitled to another set of tires at a reduced rate under the mileage-prorata provisions of the tire warranty.

FM

DO YOU HAVE A CAR PROBLEM?

Just ask Mort about it. Send your question to the Car Clinic, Popular Mechanics, 224 West 57th St., New York, NY 10019. While letters cannot be answered individually, problems that are of general interest will be discussed in the column.

Service Tips

■ If your 1985-'87 Buick Century's 2.8- or 3.8-liter port or sequential fuel injected engine won't start, consider the circumstances. Is the vehicle stubborn only when it's parked nose-down on a hill? Then the solution, according to technical service bulletin (TSB) 87-6E-12, may be to have a new fuel pump installed—part No. 25115689 if the car is an '85 or '86 model; part No. 25115465 if '87.

■ The information in Honda TSB 87-010 is most important to owners of 1983 Preludes. It says that the camshaft timing belt should be replaced for the first time at 37,500 miles, and that Honda will pay for the work. In fact, owners who have already paid to have belts replaced will be reimbursed if they see their dealers.

■ Chrysler this month answered once and for all the question about the feeding of vehicles built in the U.S. which are taken to countries where only leaded fuel is sold. TSB 14-02-87 says, "Due to metallurgical composition of the piston rings and valves, operation using leaded fuel will result in accelerated wear of these engine components and engine damage will occur." Although the TSB refers to the 3-liter MMC engine, the warning applies to all engines used in vehicles built for sale in the U.S.

■ To try and straighten out a 1985-'87 AMC Eagle with an erratic fast idling speed, clean the fast-idle linkage and install a splash shield (part No. 8993549) to protect the linkage. Instructions are in MR 251 (MR is Renault's designation for TSB) which says that road splash can be contaminating the linkage.

THE ORIGINAL. COPIED BUT UNMATCHED.

We invented this style of plier. Improved it with patented can't-slip adjustment. Improved it again with our patented stress resisting flange. And still again with our new PERMALOCK fastener. All of which is why tongue and groove pliers by any other name can't match CHANNELLOCK. Be sure that name is on the pliers you buy. Send for free catalog. Channellock, Inc., Meadville, Pa. 16335

Tools by

CHAN NEL LOCK

For you who want the best.



©1987 CHANNELLOCK

CHANNELLOCK Pliers Are American Made

Guarantee. It's good for as long as you own your Ford car. Ask to see the limited warranty and the service guarantee when you visit your Ford Dealer.

**Ford. Best-built American cars...
six years running.**

For the past six consecutive years, Ford quality has led all other American car companies. This is based on an average of owner-reported

FORD THUNDERBIRD

problems in the first three months of service on '86 models, and in a six-month period on '81-'85 models designed and built in North America.

Have you driven a Ford...lately?



Buckle up—Together we can save lives.



King Cab Nissan Hardbody pickup with light bar and off-road tires was a real head-turner.

NISSAN SE PICKUP

A real prize.

FORD TAURUS LX

We hated to see it go.

OLDSMOBILE DELTA 88

The drama continues.

Since our last episode (see page 120, Dec. '86) three cars have gone back to their makers, we've kept one truck and had a brief fling with another. Our Subaru 3-Door Turbo was returned after nearly 8000 trouble-free miles, but Contributing Editor Rich Taylor liked the Mazda B2000 pickup truck so much that he bought it. Rich reports that it's now gone more than 15,000 miles, much of it towing a heavy V8 race car, without a single glitch. But Rich does talk wistfully about Mazda's new 4x4 B2600 truck, with its bigger, more powerful Mitsubishi engine.

Nissan SE 4x4

If nothing else, this SE King Cab "Hardbody" 4x4 pickup certainly had the highest rate of parking-lot admirers of almost anything we've driven in a long time. Almost daily, someone wanted to talk to us about it, admiring its aggressive looks and elegant styling.

While we normally put considerably more mileage on our long-term test vehicles, out of deference to our lucky contest winner (see *We Have A Winner!*, page 99), we restricted ourselves to only about 2300 break-in miles.

We liked the Hardbody's ability to extricate itself from the densest, plowed-in Manhattan snowbank. Yes, there are such things.

Last winter we had a lot of snow and New York City followed its usual plan

of plowing it into big piles and praying for an early Spring. Effortlessly going into 4-wheel drive, the automatic front hubs make it unnecessary to get out of the driver's seat.

The 5-speed transmission is perhaps



When the Delta 88 was good, it was very, very good, but the rest of the time...

the smoothest to shift of any vehicle we've driven in recent years. That's good because the claimed 140-hp engine needs to be shifted a lot to keep up with traffic. For only 18 or so mpg, even in 2-wheel drive, we expected something that had a little more oomph.

Make no mistake about this truck, it's a truck; you'll realize that right away, with stiff springs and rear brakes that lock up early if the bed is empty. As a work truck, or a truck dedicated to semi-serious off-roading, it'll be in its best element.

The interior in our truck was plushly carpeted and generally very nice, putting many cars to shame. However, the

(Please turn to page 160)



Taurus wagon pleased everyone with its combination of traditional practicality, radical styling and excellent manners.

PM TECHNOLOGY UPDATE 7/87



People Who Live In Globe Houses

How do you reconcile the dream of living in detached housing in an increasingly crowded world? That's the dilemma that faced Dutch architect Dries Kreijkamp of Breda, The Netherlands. So Kreijkamp set out to maximize interior living volume and minimize exterior space. The result is the field of 85 globe houses sprouting on the outskirts of Hertogenbosch. "Basically,

the dwellings are meant for a maximum of two persons, plus a baby," Kreijkamp says, "and I emphasize the word 'baby.'" The 4-level globes measure $5\frac{1}{2}$ -meters wide and are made of a cement-reinforced plastic of Dutch manufacture called GVC. The walls are 10 centimeters thick and utilize a sandwich construction. The globes are placed on pedestals 2.5 meters high and 3

meters wide, requiring only 6.67 square meters of land. Tenants enter through the pedestal, which also contains a storage room and space for a heating plant. A staircase leads to a bedroom on the next level, and eating/living facilities on the top floor. Windows are 1.2 meters wide (inset) and round out the globular motif. They also contribute to the houses' passive solar characteristics.

Living in the round is one proposal for detached, multi-family housing. Architects say the multi-level design is adequate for a couple and a small child. Foreground, the whimsical touch of this Dutch housing project extends to the park benches—shaped like scrub brushes.

Editor: Tim Cole
Contributors: Theo C. Bernsen,
Ed Valigursky, Ted
Francis, Carter Hillyer

TECHNOLOGY UPDATE 7/87

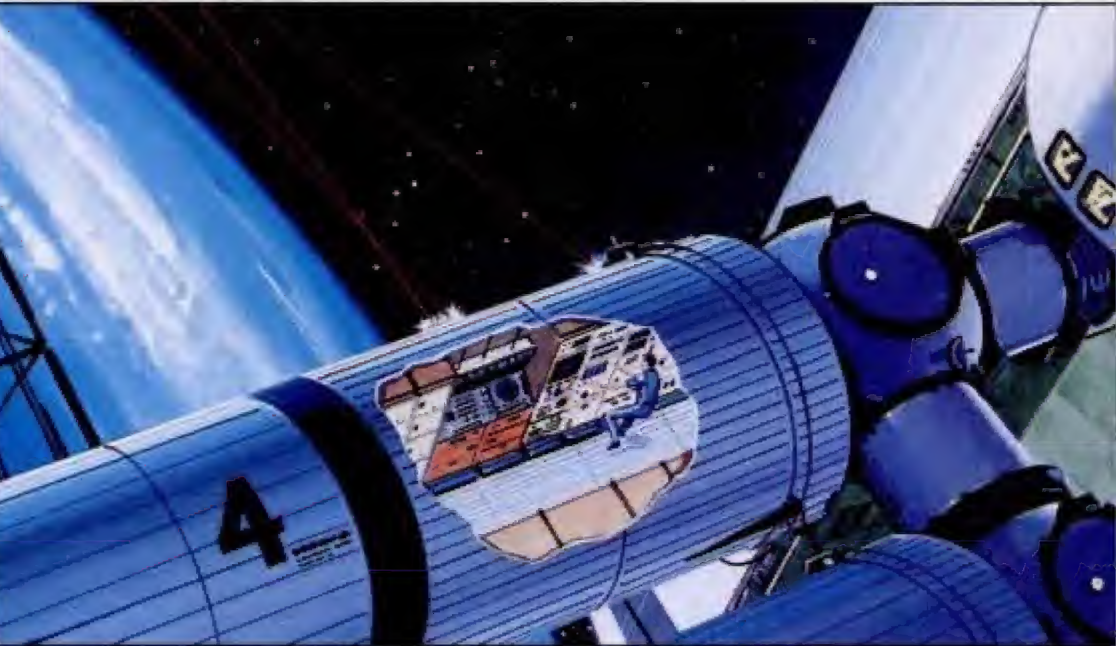
SPACE

Space Station: Fixing A Leak

In a worst-case scenario, a random strike by space debris or a micrometeoroid could lead to a deadly loss of life-sustaining atmosphere aboard America's orbiting space station. So engineers at Boeing Aerospace have developed a solution to what they term "penetration damage control;" it's reminiscent of the way you might repair a puncture in a bicycle tire.



BOEING PHOTO



ART ILLUSTRATION BY ED VALCOURSKY

More than a simple rubber patch, however, it would consist of aluminum tape backed by a silicon-based, space-qualified adhesive. The proposed space patch would be 7 in. in diameter

and about 8 mils thick, with a special cushion to prevent the damaged space station skin from ripping it. Most repairs would be effected internally. Repair of more serious damage would be per-

formed during extravehicular activity (EVA) using the specially designed patch handle (inset) that would allow astronauts wearing thick gloves to pick up and handle the patch with ease.

AVIATION

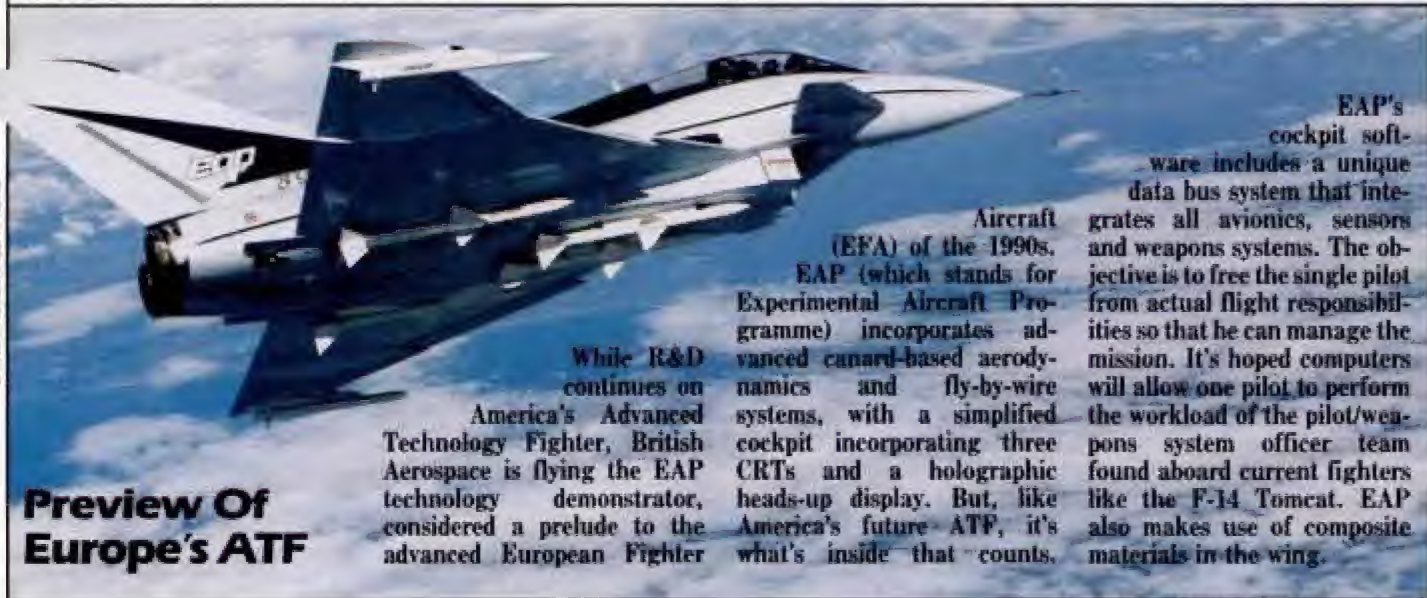
Digital Map For Future Cockpits

This high-density (640 pixels × 480) computer-graphic navigation aid from Harris Corp. can store information on more than 250,000 square kilometers of territory, obtained prior to combat from

aerial reconnaissance. The display can segregate civilian installations from military targets and zoom close for a tree-top preview of the strike zone. Controlled by a simple joystick to reduce pilot workload, the nav/aid also offers critical flight information like altitude above sea level.



HARRIS CORP. PHOTO



BRITISH AEROSPACE PHOTO

Preview Of Europe's ATF

While R&D continues on America's Advanced Technology Fighter, British Aerospace is flying the EAP technology demonstrator, considered a prelude to the advanced European Fighter

Aircraft (EFA) of the 1990s. EAP (which stands for Experimental Aircraft Programme) incorporates advanced canard-based aerodynamics and fly-by-wire systems, with a simplified cockpit incorporating three CRTs and a holographic heads-up display. But, like America's future ATF, it's what's inside that counts.

EAP's cockpit software includes a unique data bus system that integrates all avionics, sensors and weapons systems. The objective is to free the single pilot from actual flight responsibilities so that he can manage the mission. It's hoped computers will allow one pilot to perform the workload of the pilot/weapon system officer team found aboard current fighters like the F-14 Tomcat. EAP also makes use of composite materials in the wing.



Electronic Firefighter

Air-dropped to the scene of a forest fire, the Handar Remote Automatic Weather Station (RAWS) instantly alerts fire fighters on the ground and in the air to treacherous weather changes. The portable system can transmit temperature, relative humidity, wind direction and speed, rainfall duration and amount, plus forest fuel temperature and moisture. A synthesized voice transmits

the information to ground personnel via 2-way radio. Information can also be transmitted to fire control centers via satellite, and then broadcast to personnel at the fire site. Between fires, the solar-powered RAWS supplements permanent weather towers and develops fire danger ratings. It also assists managers at the Interagency Fire Center in Boise, Idaho, who produce a profile of forest-fire behavior based on weather information, site characteristics and lightning strike data.

MARINE



Sub Could Go Nuclear

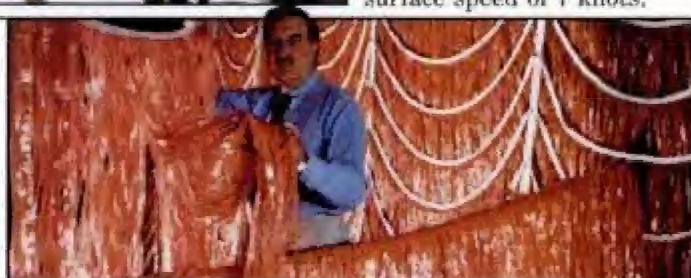
At more than 28 meters length overall, it's the largest commercial submarine ever launched, a combination mobile underwater habitat and highly autonomous, long-range submersible. Best of all, the Canadian-French joint venture, dubbed Saga I, is expected to be converted into Saga N, the world's first nuclear-powered, privately owned sub, sometime after 1988. In the meantime, designers say Saga I will be powered by dual closed-cycle Stirling engines, modified by the Swedish firm Kochum. The Stirling is based on a 19th century principle involving the expansion and contraction of a working gas (helium in this case), which acts on a piston or pistons. It's anticipated that Saga I will be able to undertake a 150-mile submerged voyage, then support week-long saturation diving and return to base. It has a submerged speed of 6 knots and a diesel-powered surface speed of 7 knots.

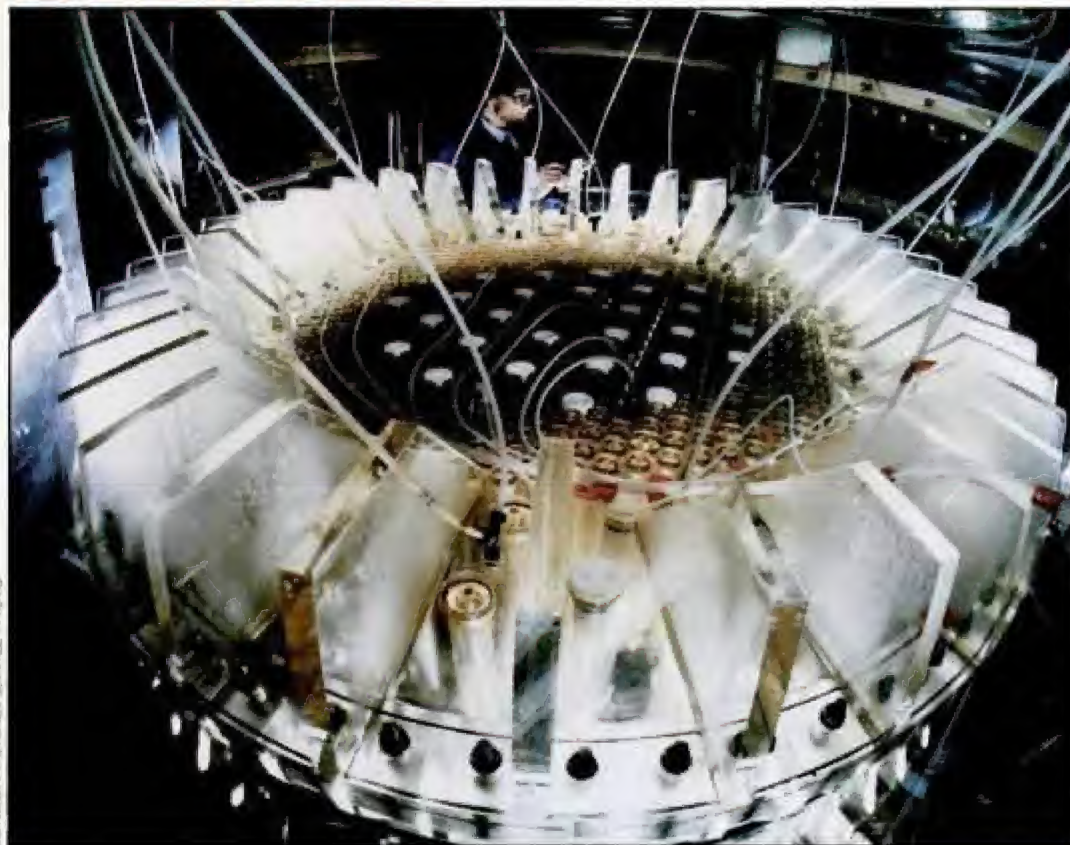


Fighting Subsea Erosion

Britain's Seabed Scour Control Systems Co. has solved the problem of fractures to underwater pipelines and footings with nets made of

polypropylene tape. Each tape is fibrillated to give approximately 4.5 million filaments per 30 x 5-meter net section. The filaments catch and hold current-borne sand or soil, forming a permanent barrier under the structure.





ENERGY

Reactor Model Tests Design

The objective of the $\frac{1}{4}$ -scale, clear-plastic mockup is to see how a fluid behaves as it flows through and around a newly designed high-pressure nuclear reactor plenum. Scientists at Britain's National Nuclear Corp., who designed the model, report the full-scale plenum, when built, will support the nuclear reactor core of the proposed Commercial Fast Reactor and will direct a flow of liquid sodium coolant through the CFR's fuel assemblies. Researchers are also checking the core-plenum model for unnecessary vibration that might be caused by the high velocity of sodium coolant through the plenum inlets.

TU

Is Newman's Car For Real?

The United States Patent Office doesn't think so, and neither do some disbelievers scattered across America. But Joseph Newman of Lucedale, Mississippi, backed by some topflight scientific opinionmakers, may have tapped the fundamental energy of the smallest particles of matter. At recent demonstrations, the "backwoods" inventor powered an 1800-pound fiberglass car at a speed of 8 mph for more than 34 hours. A faulty transmission and a bent rotor shaft foiled a faster speed for the vehicle, which, Newman predicts, will travel 60 mph and cost under \$5000. Newman's vehicle uses a 200-pound battery pack made up of 9-volt transistor batteries connected in series. The pack supplies 17,000 volts, but the energy machine under the cowl draws only 18 milliamps of current. The machine, on the other hand, produces 125 milliamps of current and more than

100,000 volts. How's that? Newman says the power source comes from within the atoms of the machine's 240-pound, 30-gauge copper-wire coil and 200-pound rotating magnet.

The machine consists of a battery pack, commutator, rotating magnet and a long coil of copper wire. Battery current flows into the commutator in three segments: fire, blank and short. In the fire position, current flows into the copper coil causing atoms to align and release a minute portion of their gyroscopic particles, creating a magnetic field. In the blank segment, voltage is broken, and when these gyroscopic particles attempt to return to the wire, they create an electric current. The short segment permits the energy produced by the collapsing magnetic field to complete the circuit. Newman is calling it "Gyro Power," and it may not be just the stuff of dreams.



SELF HELP

GREASE GUN KIT
LubriMatic
CODE No. 11105
Grease CARTRIDGE

GREASE FITTINGS
LubriMatic
CODE 11110
1/4-20 Assortment

LubriMatic
GEAR LUBRICANT
SAE 90W90 EP

LubriMatic
Heavy Duty
MULTI-PURPOSE
LUBRICATING
GREASE

LubriMatic
2-CYCLE
ENGINE OIL
CAUTION: Contains
lead and other
materials which
are toxic when
used in excess.

LubriMatic
POWER MOWER OIL
4-CYCLE AIR COOLED
ENGINES
Net 32 Fl. Oz. - 1 Quart (946 ml.)

Doing it yourself is great,
but it's not always easy.
Sometimes you need a little help.
LubriMatic® brand products can give you all
the help you need. We're the world's only manufacturer
of a full line of quality lubricants, lubrication equipment
and accessories. Since all we do is lubrication, we do it
better. And that means better results for you.
So no matter what you work on or with, if it moves,
we'll keep it moving better and longer.
If you'd like a little help around the house, help yourself
to the LubriMatic® brand at leading automotive and
hardware retailers everywhere.

LubriMatic
Division of White Corporation

Seat belts save lives.

*Based on R.L. Polk Registration counts as of July 1, 1985. ©SUBARU OF AMERICA, INC. 1987

SUBARU 4 WHEEL DRIVE KEEPS A CAR FROM BECOMING AN OFF ROAD VEHICLE.

Subaru 4 Wheel Drive is designed to keep you on the road regardless of the conditions. In fact, we feel so strongly about the traction it gives, we offer 4 wheel drive on virtually every car we build. So there's no reason to think of it as something found only on trucks.

And over the years, we've offered everything from the "On Demand" 4 wheel drive system to a new state-of-the-art Full Time 4 Wheel Drive system.

What's more, a Subaru with 4 wheel drive is reasonable to buy, maintain and operate. Not to mention, Subaru is the number one 4 wheel drive car in America.* Subaru, the car that keeps hazardous road conditions from turning into hazardous driving conditions.



SUBARU.
Inexpensive. And built to stay that way.

SALES TAX, LICENSE, TITLE, AND REGISTRATION FEES VARY BY STATE. *BASED ON R.L. POLK REGISTRATION COUNTS AS OF JULY 1, 1985. ©SUBARU OF AMERICA, INC. 1987

THE CARS OF MIAMI VICE

Automotive engineering is the real star of this TV megahit.

BY CLIFF GROMER

Actors Don Johnson and Philip Michael Thomas relax on the original "Vice" car, a Ferrari Daytona Spyder look-alike powered by Chevrolet.

The sleek, black-and-white convertible rolls up to a curbside berth. It is the Moby Dick of Mercedes-Benzes, outrageous in proportion, sublime in appointments. An underworld type (TV good guys don't ride in MBs) emerges from Moby Dick's white flanks. Draped on his arm is a knockout in high heels—entertainment for the evening. And as the camera pulls back for a wide-angle shot, you see just how radical this Mercedes really is.

The car has all the exterior trappings of a high-performance sports car: monochromatic paint scheme, racing wheels and tires, AMG-style spoilers, ground-effect skirts



and air dams. Inside is the bar, TV, remote-control VCR. The ultimate touch, though, is the badge on the trunklid. The top-of-the-line Mercedes currently available in this country is the 560 series. But this car goes a step beyond. The badge reads 10,000 SEL.

Remember now, all this high-performance stuff is on a limousine, and a limousine stretched by 50 inches at that. It's enough to make a true Mercedes aficionado weep. But it's the kind of car "Miami Vice" fans have come to expect.

As a matter of fact, "Miami Vice" has become a cult program for car lovers. Writers and producers use automobiles to make real statements about the scenes unfolding on your TV screen. Cars set the tone, and establishing the show's style requires the engineering skill and artistic finesse of people like Carl Roberts of Kingsport, Tennessee. The car fabricator helped the show's Ferrari Testa-



Sonny Crockett's first ride on the show was a Ferrari 365GTB Daytona Spyder replica (top). Called the California Daytona, the black roadster was basically a Chevrolet Corvette underneath with a hopped-up, small-block Chevy V8 for power. Above, and left, the sleek fiberglass body panels stood up to stunts and camera mounts for two years before being retired. Automobiles of all makes and eras are an important stylistic device on "Miami Vice."

TOP: PM PHOTO BY BRIAN KING, MIDDLE AND ABOVE: S. GELBERG/GLOBE PHOTOS



The 428 Cobra Jet-powered '69 Mercury Cougar GT (top), and bright red '68 Pontiac GTO hardtop (lower middle), have been seen in several episodes. The "luxury-to-excess" theme is personified in metal through the tongue-in-cheek Mercedes-Benz 10,000SEL limo, complete with a special ground-effects package. Tubbs, Crockett's partner, struggles along with a mint condition '63 Cadillac DeVille convertible (upper middle).



rossa achieve a status equal to that of Crockett, Tubbs and the rest of the cast.

The car-as-stylistic-device got a start with the car driven by main protagonist Sonny Crockett, played by actor Don Johnson. His original machine was a Daytona Spyder, or rather, a look-alike Ferrari 365 GTB/4 Daytona Spyder. The first significant "Vice" car, it was a prop Sonny needed to infiltrate the high-roller world of drugs, prostitution and other assorted illegalities that support Miami's crime empire. Crockett had to dress the part, and had to go the whole routine. The lifestyles of the Miami vice-lords give fresh meaning to the term ostentatious.

Check out the clothes: Rumpled white linen suits with rolled up pant legs, hot pink scooped-neck T-shirts, \$400 Charles Jourdan loafers. Check out the toys: An Endeavour 42-ft. yacht for living quarters, a 38-ft. Wellcraft Scarab with twin 440 Mercs for play.

All the while Crockett drones about town in a Ferrari Daytona Spyder look-alike, picking up groceries the way we would use a Chevy Impala.

The rest of the "Miami Vice" team weren't ignored when the cool cars were handed out.

Crockett's partner and fellow player, Ricardo Tubbs, played by actor Philip Michael Thomas, gets to pilot a pristine '63 Cadillac DeVille convertible. It may not be the wheels of choice for an underworld over-achiever, but it passes as the mark of a hard worker who has managed to cut out some kind of turf. Switek, another "Vice" cop, gets to drive a turquoise '63 Ford Thunderbird.

Forget for a moment the show's obvious flaws. Forget that Crockett was an All-American football hero who once ran a screen pass 95 yards in the Gator Bowl. You figure it out how a guy like this can make it as an undercover cop without being recognized. Forget the fact that Crockett and Tubbs regularly investigate

TOP: PHIL KUNZ PHOTO; UPPER CENTER: S. GELBERG/GLOBE PHOTOS; LOWER CENTER: PAUL ZAZARINE; ABOVE: C.R. MOTORING PHOTO



all kinds of murders and go on busts—activities that would certainly blow their rather tenuous cover.

Forget also that "Miami Vice" has skidded in the ratings and regularly gets busted by its time-slot rival "Dallas." And while you're at it, forget the show's boring and tedious plots, flat dialogue and general heaviness to the scripts. The point is, if you consider it a treat to see rare and unusual cars, "Miami Vice" is the show for you.

Not all the cars on the show reek of blatant excess. Some are more subtle, you have to be paying attention to notice them, as many are just roll-ons.

For instance, the producers had access to a mint-condition 1968 Pontiac GTO. An original, red car with black interior, the model was equipped with the hideaway headlight option and Rally II wheels. This was a car that had been recognized in 1968 as Motor Trend's Car of the Year. It was the best-selling GTO model of all time and was a benchmark muscle car of the '60s. Many GTO enthusiasts consider the '68 to be the best looking of the entire GTO series.

So how was the car used on the show? In one episode, a drug dealer drove it to a buy. You see him pulling up to a building, go inside to do business, then come back

out and drive away. Most sitcom shows would have the dope dealer driving something like an '84 Monte Carlo, or even a beat-up van.

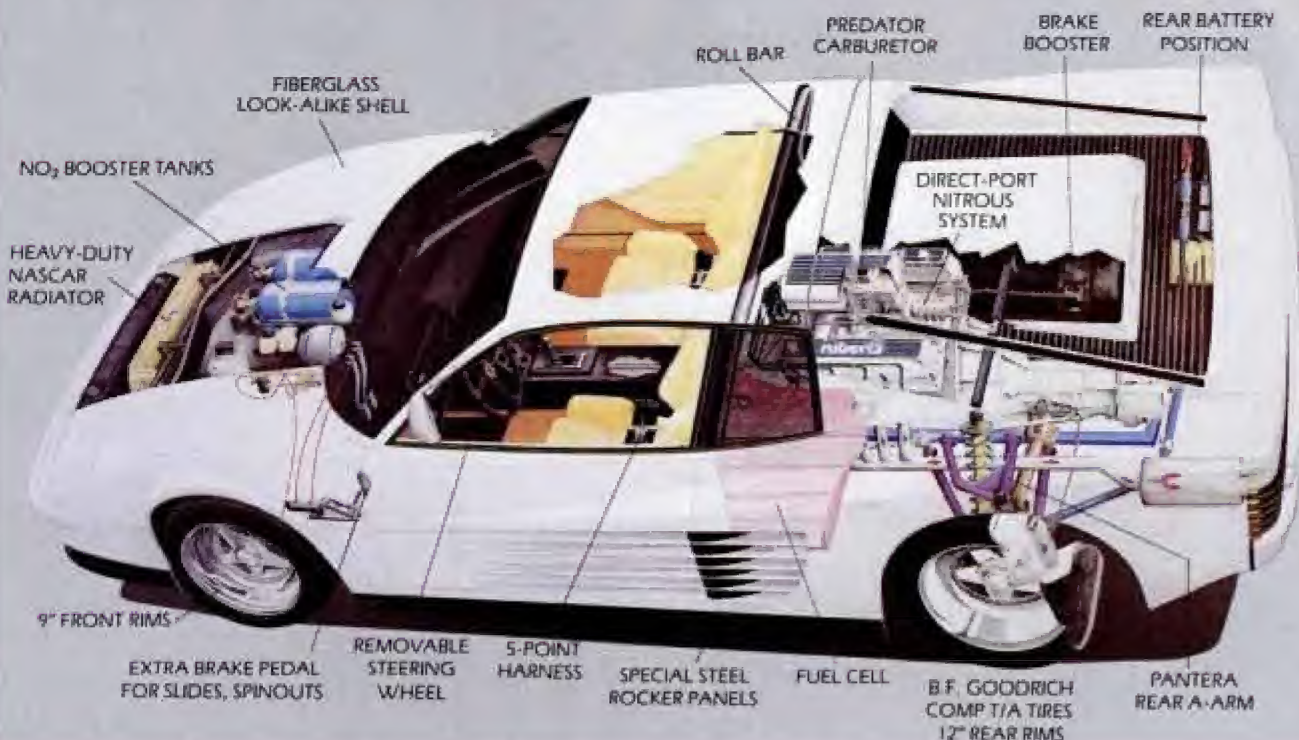
Another muscle car, much rarer than the GTO, also made an appearance as the daily driver of a drug dealer. A limited-production high-performance 1969 Mercury Cougar GT, the car was optioned out with the big 428-cu.-in. Cobra Jet engine, special hood scoop and styled wheels.

Where does "Miami Vice" get all their neat cars? They rent some and build some. Sources include individual collectors, auto specialty shops and car fabricators like Roberts. The original

Ferrari look-alike used by Crockett was spotted on a lot in Newport Beach by the show's producer. He knew the car had the perfect image for his lead character. The car was a custom-built machine using Ferrari-design, fiberglass panels adapted to a 1980 Corvette chassis. And some real Ferrari hardware integrated with the car added to the Ferrari effect.

When the new model Ferrari Testarossa came out, it was decided to update the Ferrari on "Vice" to the trick-looking new machine. Plus, the real Ferrari North American people got a little miffed that these fakos were getting so much attention.

INSIDE CROCKETT'S STUNT "FERRARI"



"Miami Vice" took on a new look this year which included a new car for Sonny Crockett—a black Ferrari Testarossa (right). When the car didn't show up in night scenes it was painted white. A look-alike replica (left) is used for all car chases and stunt work. Underneath the Ferrari body panels, the stunt car is basically a mid-engined DeTomaso Pantera powered by a modified 351 Cleveland Ford engine.



They offered to supply two real Ferrari Testarossas for the show. The Testarossa was Ferrari's latest model and one would be used regularly and one would be kept as a backup. The cars were supplied to the producers painted black, but when they didn't show up well in night scenes, they were later painted white. To create a car that would perform stunts, "Miami Vice" producers turned to the Roberts Motor Co., which had specialized in safety-oriented stunt cars for the movie and TV industries. Carl Roberts' assignment was to build a Testarossa look-alike that would be able to stand up to the rigors of

stunt duty. In effect, Roberts was asked to build an automotive Thespian that would breathe life and action into the show just as much as the human players. Unlike the front-engined Daytonas, the Testarossa was a mid-engined car, so using a Corvette chassis as a starting point wouldn't work. The proportions of the car were wrong. So Roberts took a 1972 DeTomaso Pantera—a perfect car with 12,000 miles on the clock and a collector value of about \$30,000—and chopped it apart.

Roberts designed Testarossa look-alike, fiberglass body panels working from pictures in a magazine, and

parts he salvaged from a wrecked Testarossa. He molded a 1-piece nose for the car that was easily removed for service access to the front end.

Another reason for the fiberglass body sections is that they were easily replaceable in the event a stunt got out of control.

To beef up the Pantera's chassis to handle jumps without the force of impact causing the roof to buckle, an additional subframe made from 2½-in. square tubing was bolted to the chassis. The subframe also works as a skid plate to protect the bottom of the car from impact. The suspension also was upgraded with

stiffer springs to make the car more rigid, plus Koni shocks. To get the additional ground clearance necessary for the jump maneuvers, the body was shimmed up 1½ in. and extra body mounts were added for more support.

Driver protection presented a problem from a visual point of view. A full roll cage would have been the way to go for maximum safety, but the roll bars would have been visible around the windshield posts. A compromise was reached by installing a roll bar just behind the driver's seat in the engine compartment. The bar was attached to reinforced areas of the frame rails and further reinforced with ¼-in. steel plates at about the mid-point of the bar for vertical support. A fuel cell was used to prevent spillage during rollovers or crashes, and a competition safety harness was installed.

The Grant steering wheel is another safety feature. It is easily removable in case of an accident so the driver can be freed in case he's

(Please turn to page 156)

ASIAN



Koreans Kim Woo-Choong and Chung Ju-Yung may soon be as well known in America as Lee Iacocca and Roger Smith. Mr. Chung is the chairman of Hyundai, which in 1986 had the most successful introductory year ever for an import. Hyundai sold an incredible 160,000 Excels, and hopes to raise that to 250,000 in 1987.

Mr. Kim, the chairman of Daewoo, expects to sell 100,000 cars in America this year. Unlike Hyundai, which established a new dealer network from scratch, Daewoo is selling its cars through Pontiac dealers. This gives Daewoo access to GM technology, not to mention a ready-made dealer body.

Daewoo and Hyundai are perfect examples of the most important change in the auto-

mobile industry since Honda, Toyota and Datsun opened up the American market 20 years ago. While it's no longer economically feasible to build low-cost cars in America, the Voluntary Import Restrictions plus weakened dollar have forced Japanese automakers to sell ever-more-expensive models in the U.S.

Small car production is shifting to Third World countries where wages are lower, the work ethic is stronger and governments are more lenient to heavy industry. The low-cost cars these countries produce will still be sold in America and Western Europe, because that's where the money is.

Once their workers have earned enough to trade in their bicycles for automobiles, these same Third World factories will start pro-

At speed (from left) are Dodge Colt (Japan); Hyundai Excel (Korea); Ford Festiva (Korea); Mercury Tracer (Japan, by way

INVASION!

We test 8 captive imports with rock-bottom prices and mixed parentage.



ducing cars for local consumption. The same strategy carried Japan from postwar ruin to impressive prosperity in just a few decades—and it's worked so well, that Japan can no longer compete with Asian or South American workers.

We finally have an International Automobile Industry. For the first time, cars are being built and sold all over the world, not just in "developed" countries. But since Europe, Japan and America have the markets and technology, virtually all of them are cooperative ventures.

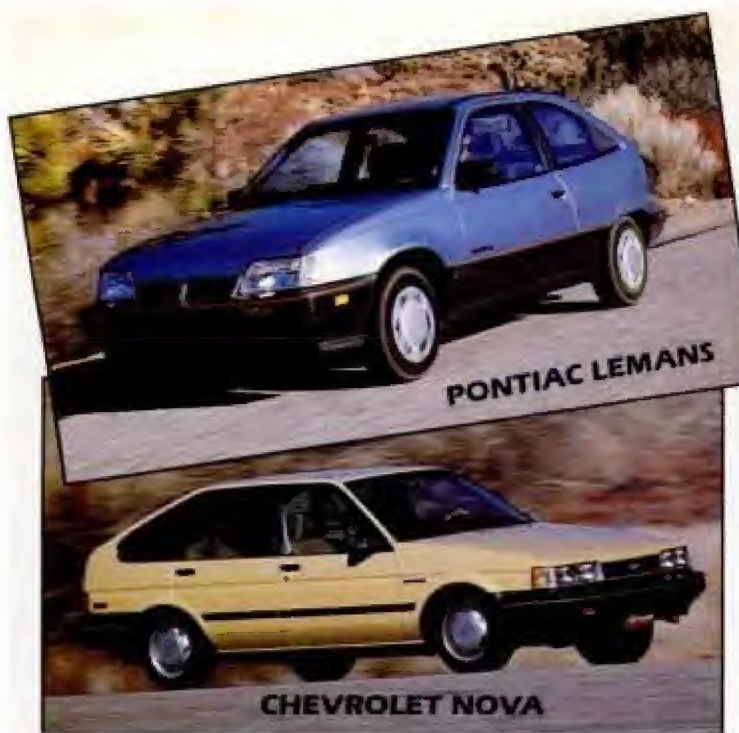
Take the Daewoo, for example. It was designed in Germany as an Opel Kadette. It's also called a Vauxhall in England, and sold in nearly every European country. The Daewoo version was restyled in Warren,

Michigan, to fit in with other Pontiacs, and named the LeMans after a French racetrack. But it's built entirely in Korea of parts sourced all over the world.

The Hyundai is even more of an international venture. It's based on Mitsubishi mechanicals engineered in Japan, but with a body styled by Giorgetto Giugiaro in Turin, Italy. It's built in Korea in a Mitsubishi-engineered factory, from parts sourced all over. It's sold in America by Hyundai, but in yet another twist, Mitsubishi is buying cars from Hyundai and selling them as the Mitsubishi Precis. It's now cheaper for Mitsubishi to import cars from Korea than build them in Japan!

We identified eight of these inexpensive cars on the American market. In addition to

of Mexico); Pontiac LeMans (Korea) and Chevy captives from Japan: Sprint, Spectrum and Nova [by way of California].



PONTIAC LEMANS

CHEVROLET NOVA



CHEVROLET SPECTRUM



MERCURY TRACER

the Hyundai Excel/Mitsubishi Precis and Daewoo LeMans, Ford is importing a Mazda-designed Festiva from Korea as well as a restyled Mazda 323 assembled in Mexico and labeled a Mercury Tracer in this country.

Chrysler's Dodge Colt is a Mitsubishi Mirage built in Japan, while Chevrolet's Sprint started life as a Suzuki Cultus in Japan. Chevrolet dealers also import the Isuzu I-Mark from Japan and call it Spectrum. Then there's the Chevrolet Nova, a Toyota Corolla assembled in America of Japanese parts.

We did our track testing at Los Angeles County Raceway in Palmdale, our photography at El Mirage Dry Lake, and our back-to-back driving loops in the high-desert foothills of the San Gabriel Mountains.

The average price of our eight "low-cost" Third World cars—even including the Hyundai—is a heady \$8560, despite \$94-a-month wages in places like Mexico.

Mercury Tracer

Our testers unanimously picked the Mercury Tracer, nee Mazda 323, as the best car in this group. Happily, there's more than just a trace of the 323 left in the Tracer, despite its move to Mexico and a facelifting by Ford designers in Dearborn. At first glance, the Tracer seems much more rounded than the 323, but in fact, it's identical except for replacement grille, taillights and bumpers, plus repositioned body side moldings.

The Tracer will soon replace the Lynx in Mercury's lineup. It's available now as a 3- or 5-door hatchback. A Tracer station wagon is on the way. Our group thought our test 5-



HYUNDAI EXCEL

Text by Rich Taylor; Photos by Studio 10

SPECIFICATIONS AND DIMENSIONS

MANUFACTURER/MODEL	BASE PRICE	PRICE AS TESTED	ENGINE	TRANSMISSION	WHEEL-BASE (in.)	LENGTH (in.)	WEIGHT (lb.)
Chevrolet Nova	\$8548	\$11,007	74-hp SOHC 1.6-liter Inline-4	3-speed automatic	95.7	166.3	2250
Chevrolet Spectrum	7709	9287	70-hp SOHC 1.5-liter Inline-4	5-speed manual	94.5	158.8	1900
Chevrolet Sprint	5995	8509	48-hp SOHC 1.0-liter Inline-3	5-speed manual	88.4	141.1	1550
Dodge Colt	5407	7138	68-hp SOHC 1.5-liter Inline-4	5-speed manual	93.7	157.3	1900
Ford Festiva	5765	8000*	58-hp SOHC 1.3-liter Inline-4	5-speed manual	90.4	140.4	1750
Hyundai Excel	5195	5690	68-hp SOHC 1.5-liter Inline-4	4-speed manual	93.7	160.9	2150
Mercury Tracer	8364	9856	71-hp SOHC 1.6-liter Inline-4	5-speed manual	94.7	162.0	2158
Pontiac LeMans	7000*	9000*	74-hp SOHC 1.6-liter Inline-4	5-speed manual	99.21	163.7	2153

*Estimate

1. Best speed while weaving through seven cones placed 100 ft. apart; the higher the speed, the better the transient handling.

2. G-forces generated during steady-state cornering around a 200-ft.-dia. circle; cw = clockwise, ccw = counterclockwise.

3. The number of standard-size grocery bags that will stand upright (1-in. crush space permitted) in trunk with rear seats up.



CHEVROLET SPRINT



DODGE COLT

Ford Festiva

The Festiva is really in a different class from the Tracer—part of the “micro-mini group.” In crowded Japan, this is a popular market segment, but the Festiva, Sprint, Daihatsu Charade and Subaru Justy are the only shoeboxes of this size to make it to America—so far.

Designed by Mazda, the Festiva is assembled by Ford’s partner in Korea, Kia Motors, though the drivetrain is built by Mazda. Like the Tracer, the Festiva has been given heavy, rubberized bumper/airdams front and rear, with

door was “prettier than the usual 5-door hatch,” and surprisingly roomy for both passengers and cargo. The interior is identical to that in the 323.

Said our testers, “All controls are where they should be. Instrument cluster is excellent, everything can be read at a glance.” The Mercury Tracer’s bucket seats came in for special praise: “Fabric seats are a nice luxury in this price range, and give an excellent seating position with plenty of headroom.”

Mostly though, our testers were impressed by the chassis. “Responsive, quick and more sporty to drive than its appearance would suggest,” as one tester put it. Our testers’ summations were unanimously glowing. The quality of fit and finish is a tribute to the Mexican workers in the new, highly automated Hermosillo factory.



FORD FESTIVA

TEST RESULTS

GAS MILEAGE (EPA city/ PM test)	1/4-MILE (sec. @ mph)	0-60 mph (sec.)	BRAKING (ft.) (60-0 mph)	SLALOM ¹ (mph)	SKIDPAD ² (cw/ccw)	TRUNK SPACE ³	INTERIOR SPACE INDEX ⁴	TEST TRACK RANKING ⁵	ROAD TEST RANKING ⁶	OVERALL RATING ⁷
29/25.54	19.732 @ 69.38	16.54	126.8	55.41	.70/.74	15	150.78	6	6	6
37/27.47	18.568 @ 71.95	14.19	140.7	52.51	.70/.72	15	138.00	8	5	8
44/37.72	20.469 @ 69.43	15.09	119.4	54.58	.71/.72	8	134.19	5	4	3
37/28.57	18.603 @ 71.90	15.27	125.0	56.05	.69/.73	11	147.56	7	3	4
39/37.20	17.890 @ 75.80	10.39	113.6	55.30	.74/.76	8	137.90	2	2	2
29/30.25	18.953 @ 70.12	14.99	127.0	53.92	.73/.74	11	144.94	4	8	7
28/26.86	17.744 @ 75.76	12.19	135.6	57.80	.73/.76	11	160.69	1	1	1
31/25.64	18.405 @ 73.32	12.97	137.4	54.47	.75/.75	14	157.06	3	7	5

4. Front-seat width × headroom × legroom + rear-seat width × headroom × legroom ÷ 1000.

5. Points are awarded from best (1) to worst (8) in each category. Fewest total points ranks first, and so on.

6. Subjective ranking on the road by a team of testers; cars are graded by “feel,” independent of test track results.

7. Average of Test Track and Road Test ratings. Road Test score breaks ties. Bold numbers show best performance.

ASIAN INVASION

body-side moldings that continue the bumper line. The 1.3-liter 4-cylinder is essentially a smaller version of the Mazda 1.6-liter Four in the Tracer. The Festiva weighs 400 pounds less, so performance of the two siblings is virtually identical.

Even with just 58 hp, the little Festiva zoomed 0 to 60 quicker than any other car in this test. It had the shortest braking distances, too, and was near the top in our handling trials.

The Festiva is a blast to drive—a modern-day Mini Cooper. Our testers praised the “positive” shifter, “responsive” steering and “stable” handling. “I’d have no qualms about driving this car 80-plus all day; lots of fun and surprisingly steady, with great gas mileage,” said one tester.

Even those of us who like the Festiva have a hard time thinking of it as a “real” car. The Festiva is “just a skateboard, a perfect college car, or second or third family car for everyday running around.”

Our testers were unusually enthusiastic about the Festiva. “This car is pure fun, peppy and impish, but also well-mannered and cute.”

Chevrolet Sprint

We liked the Sprint. But with only 48 hp from three cylinders, it's also about the slowest car we've tested since the Volkswagen Beetle: The quarter-mile in more than 20 seconds is *slow*.

Chevrolet has come up with three different versions: There's the normal Sprint we tested, an ER model set up for maximum fuel economy (54 mpg, EPA City, the best in the country) and the Turbo. The Turbo raises horsepower from 48 to 70 and adds the usual sporty steering wheel and such, but

also raises the price to where other Mini GTs are better buys.

Our testers were impressed with the standard Sprint, despite some obvious shortcomings. Everyone called it “cute and fun,” and typical comments were “loud, slow, flimsy and too much fun!; noisy, tinny, full of vibrations. I love it!” As one tester summed it up: “Actual performance is a five; perceived performance is a 10.”

Dodge Colt

Compared to the Festiva and Sprint, the Colt is a full-size car. It feels big and sturdy, and as one perceptive tester put it, “It's hard to believe this is a stripped Japanese economy car. It has the confident road feel of a good German machine.”

The Colt is well on its way to being the universal economy car. It's built in Japan and sold all over the world in everything from stripped econocar to hot-rod Turbo versions. In America, you can buy it at Dodge, Plymouth or Mitsubishi dealers. Soon, Yugo dealers will also be selling the Colt, this time built in Malaysia and called the Proton Saga. Then there's the Hyundai Excel—a restyled Colt—not to mention the identical Precis which Mitsubishi dealers will sell next to the Mirage. That's a total of six nameplates on this same car, all available in America.

Its boxy styling is getting a bit out-of-date but, in our experience, just about every glitch was refined out of the Colt years ago. Colt owners swear by them: 100,000 miles with nothing more than new tires and oil changes seems to be a common experience.

According to our testers, the Colt is also quite a nice car. “This car is friendly,” said one. “The seats are comfortable and easily adjusted. The controls are easily reached. Small touches like

that make a big difference as the miles go by.”

Pontiac LeMans

We were looking forward to driving the LeMans, but instead of the German road car we expected, the Opel-designed, Daewoo-built LeMans is more like Japanese econoboxes from 10 or 15 years ago: mediocre-handling, underpowered, uncomfortable and sprinkled with superficial “American” styling clichés.

The 4-door LeMans looks something like a Ford Tempo while the 3-door we tested seems too stubby and cluttered. The black plastic taillights and rear quarter-window louvers were specifically criticized by our testers. The LeMans reminded one tester of Bill Mitchell's famous line: “Styling a small car is like tailoring a dwarf—it never looks quite right.”

In our testing, the LeMans was an average performer in everything except fuel economy, where it barely beat out the heavier, automatic transmission Nova for last place.

Both at the track and over the road, our testers complained about the LeMans' curious handling. As one tester put it, “This car has a very top-heavy feeling. It swings and sways, and wanders from side to side. It doesn't inspire confidence.”

Other deficiencies noted by our testers are uncomfortable seats, cramped rear leg- and headroom, vague shifting, poor plastic trim, lots of shakes and rattles, and severe axle tramp over rough surfaces.

Chevrolet Nova

The Nova, a rebadged Toyota Corolla assembled in Fremont, California, at the NUMMI joint venture factory, is by far the biggest and most expensive of these captive import/joint venture cars. The Corolla/Nova is, as one tester put it, “perfect for what it is—totally competent family transportation, totally generic, totally dull.”

The Corolla has been around for quite a while, and it's getting pretty long-in-the-tooth. Still, it's a straightforward, dependable, surprisingly comfortable sedan, with no rude surprises.

Our group specifically liked the seats, driving position and overall comfort, and complained only about minor annoyances. The worst feature of this particular car, and the one that kept it from a higher finish in this test, was the power-robbing automatic transmission, constantly hunting up and down for the right gear.

Our advice: In any of these small cars, order the 5-speed. It makes all the difference in the world in driveability, fuel economy and driving pleasure.

(Please turn to page 148)

CAPTIVE IMPORTS FAMILY TREE

Car Name In U.S. Market	Original Name	Country Of Origin	Assembled In	Drivetrain Built In
Chevy Nova	Toyota Corolla	Japan	U.S.A.	Japan
Chevy Spectrum	Isuzu I-Mark	Japan	Japan	Japan
Chevy Sprint	Suzuki Cultus	Japan	Japan	Japan
Dodge Colt	Mitsubishi Mirage	Japan	Japan	Japan
Ford Festiva	Autorama Festiva	Japan	Korea	Japan
Hyundai Excel	Mitsubishi Mirage	Japan	Korea	Korea
Mercury Tracer	Mazda 323	Japan	Mexico	Japan
Pontiac LeMans	Opel Kadette	Germany	Korea	Korea

BOX SCORE: Japan 16, Korea 5, Germany 1, Mexico 1, U.S.A. 1

GOTCHA!

Or does he? We test 10 pocket-size radar detectors against the top-rated full-size Escort.

BY RICH TAYLOR, Contributing Editor
Photos by Brian Kosoff

In our November 1986 issue, we compared 10 full-size radar detectors, plus the pocket-size Passport. Since then, a new generation of miniature detectors has hit the market. We assembled 10 of these for this test, including the Passport.

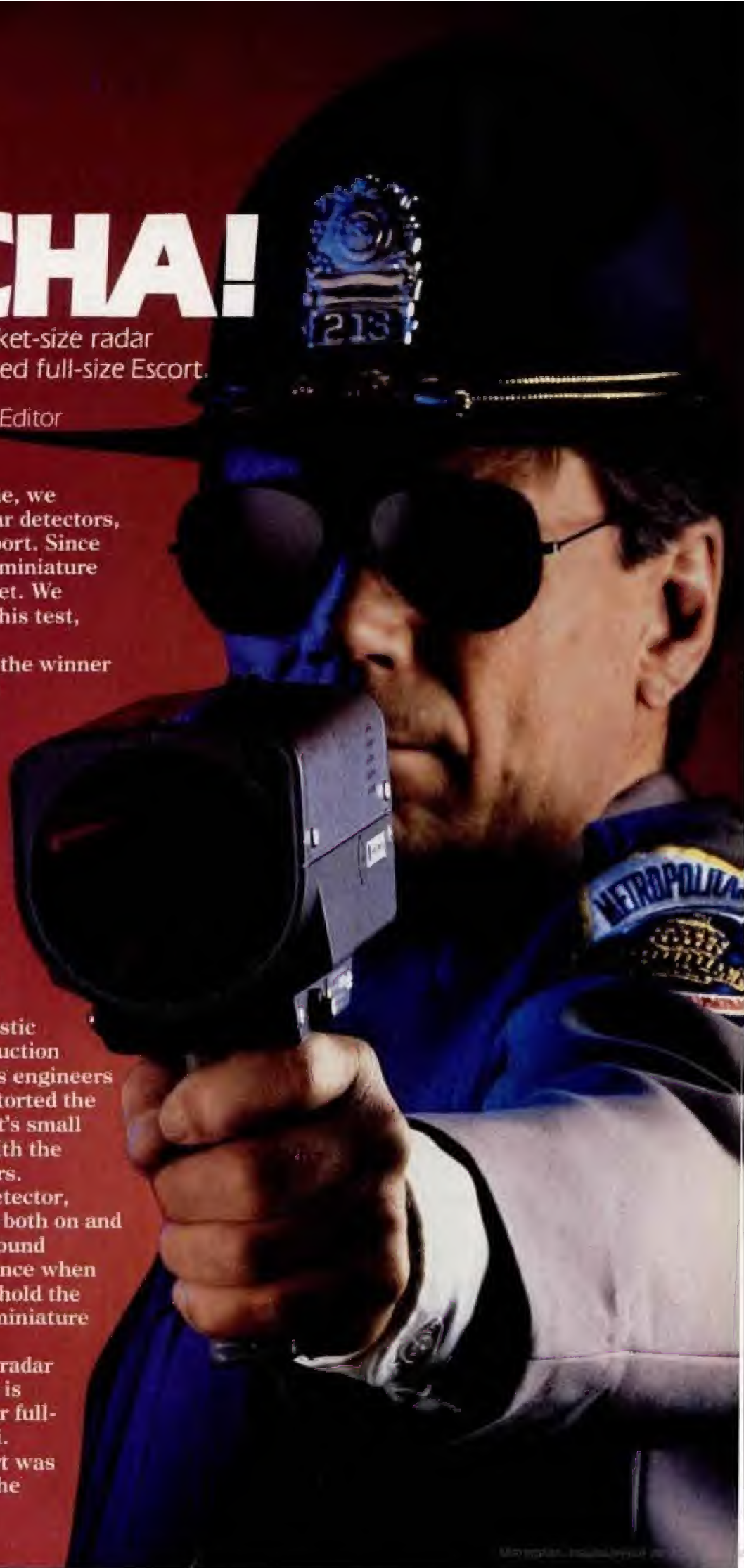
As a control, we also included the winner of our November test, Cincinnati Microwave's industry-standard Escort, plus the mid-sized Autotronics Snooper D-4000, which is billed as pocket-size.

Cincinnati Microwave was very upset with the results of our November test. Specifically, they thought that its Passport should have finished second to the winning Escort. CM blamed the Passport's poor showing on our use of a Radar Ready Mount to hold the units during testing.

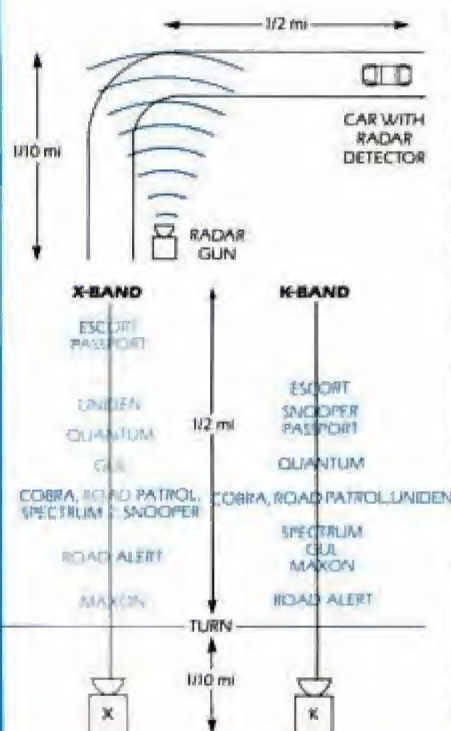
The Radar Ready is a clear plastic shelf held to the windshield by suction cups, and Cincinnati Microwave's engineers claim that these suction cups distorted the microwave signal to the Passport's small antenna, while not interfering with the signal to the larger radar detectors.

For this test, we tried every detector, including the Passport, mounted both on and off the Radar Ready Mount. We found absolutely *no* measurable difference when using the Radar Ready Mount to hold the Passport or any other detector, miniature or full-size.

Clearly, the Escort is the best radar detector around. Its performance is dramatically superior to any other full-size detector, as well as any mini. When it first came out, the Escort was the most expensive detector on the



DETECTOR PERFORMANCE AROUND A CORNER



On the majority of highways, the most convenient way for a police officer to stay out of sight while operating his radar is to aim into a blind corner. We used the same corner as in our November test.

As in our previous test, the Escort was able to find the radar from a half-mile before the corner. Consistent with the results of our previous test, Passport was easily the best of the minis, but not as good as the mid-size Snooper on K-band. The poorest-performing minis, the Maxon and Road Alert, were less than a quarter-mile from the radar before detecting it. No detector in this group had to round the corner before sniffing out Smokey. However, this may have been due to an early morning mist giving better reflectivity to the radar. In clearer weather, they might not have done so well.



X- and K-band radar guns were clamped to tripods and used alternately in tests.

DETECTOR PERFORMANCE OVER A HILL



Detectors were tested atop a microwave-neutral shoebox lid as well as the suction-cup mount used last time.

We used the same hill as in our November test of full-size detectors. Once again, the Escort was best in K-band performance—and in the absence of the full-size Uniden which won this category last time, best in X-band as well. On either X-band or K-band, the Escort can pick up radar from nearly a mile away, which is truly impressive.

Performance of the minis is not as good by comparison. This is a situation where a police officer is not likely to use an instant-on radar gun, so being able to detect the radar before the crest of the hill is of

market. This is no longer true—which makes the Escort not only the best performer, but something of a bargain.

Escort was redesigned in 1980 to reduce interference from other microwave sources, like burglar alarms, door openers and other radar detectors. We tested an older Escort belonging to one of our staff members, and found that at least on K-band, it was inferior not only to a 1987 Escort, but to all the current pocket-size detectors in our test group, as well. If you have an Escort with a serial number lower than 400,000—or any other older radar detector, for that matter—you're in the market for a replacement. Radar detector technology has changed so fast that a 5-year-old unit may not give you adequate warning.

Combining the results of both of our tests, we find that

the best full-size detectors are better than the best mini. But, there are drawbacks to a full-size detector. An Escort, for example, weighs a hefty 19.5 ounces and measures 5½ x 4½ x 1¾ in. By comparison, the Passport measures 4½ x 2½ x ¾ in. and it weighs just 6 ounces.

This makes a Passport (or any mini) literally pocket-size, while full-size detectors must travel in your briefcase. Although the Snooper and Maxon claim to be "pocket-size," the only pockets they'd fit are those in an overcoat or army fatigues.

Just about any modern detector, full-or pocket-sized, will warn you in time to avoid police radar. A police radar gun

transmits a beam that's about two lanes wide at 500 ft. from the gun, and four lanes wide at a quarter-mile. Since it's a relatively low-powered transmitter, and depends on a signal reflected off your car in order to judge your speed, the practical limit for police radar is about 1500 ft. for automobiles and 2500 ft. for big trucks. That's also about the practical limit for an officer to swear to visual identification that will stand up in court.

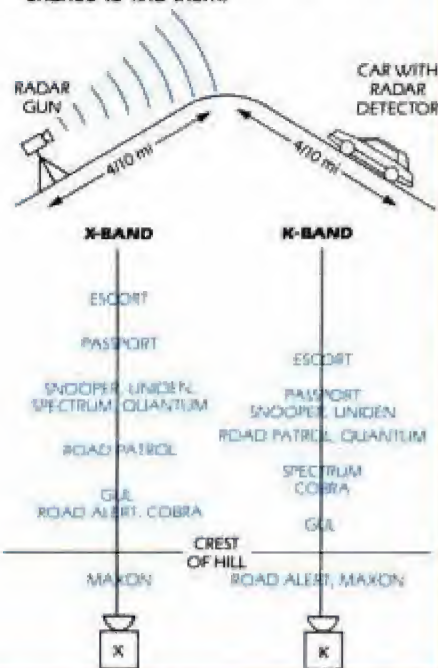
Even the worst radar detector in this test can pick up an X-band signal from 2 miles away in a straight line, and under ideal conditions the best start blatting their warning when the radar is still 3 or more miles ahead. K-band is weaker,

True pocket-sized detectors include: (A) Uniden RD-9; (B) Sparkomatic Road Alert 30; (C) BEL Quantum; (D) Passport; (E) Radio Shack Road Patrol 30; (F) Cobra Trapshooter Micro; (G) Whistler Spectrum 2; and (H) GUL G300S. Bigger pockets are needed for (I) Snooper D-4000 and (K) Maxon RD-1. Winner Escort (J) is full-size.



utmost importance. On some police cars, the radar is wired into the ignition and is always broadcasting.

The best of the minis was the Passport, noticeably better than the mid-size Snooper. The poorest of the minis, the Maxon and Road Alert, didn't find the radar until after they'd crested the hill. Unfortunately, that's also after the radar has gotten it's chance to find them.



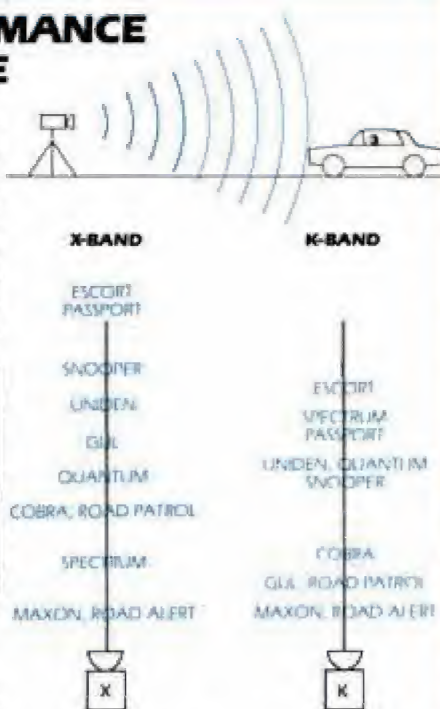
DETECTOR PERFORMANCE IN A STRAIGHT LINE

As in our full-size detector test, the Escort was the the best, with a range in excess of 4 miles. The Passport is virtually identical on X-band, not quite as good on K-band. In fact, Whistler's surprising Spectrum 2 was nearly as good as the Escort on K-band. Good sensitivity also helps pick up instant-on radar as the police trigger their guns to catch motorists ahead



About \$2700 in electronic countermeasures litter dash in long-distance test.

of you. Standard operating procedure with instant-on radar is to set the unit on HOLD and then wait for a gap in traffic. When the next group of cars approaches, the officer releases the HOLD button and zaps the group. The radar locks in on the fastest car and—9 times out of 10—the officer writes up the first car in the pack. Advance warning of these blitzes permits you to let



someone else go first. Even the worst pocket-size detectors can find radar from almost 2 miles away in a straight line. If all roads were flat Interstates—and all radar officers aimed their units right down your lane—any one would do. In the real world, they aren't, they don't and it won't.

but in a straight line you might still have a mile of warning.

The tricky situations are around corners and over hills, where the experienced radar officer will aim his gun so that he nabs you just as you turn into his beam.

Good radar detectors are sensitive enough to pick out police radar at the very fringes of this diffuse signal, and selective enough to discriminate between a legitimate X-band or K-band transmission and many (but not all) false alarms triggered by garage door openers, CBs, other radar detectors, airport radar, microwave transmission towers, even high-tension lines.

Accurately measuring false alarms is difficult, because of constantly changing real-world condi-

tions. Several detectors in our test group were fairly immune to falsies, but probably because they weren't sensitive enough to be affected by *anything* short of a thermonuclear explosion, including police speed radar.

Our car-to-car interference chart gives some idea of susceptibility to false alarms triggered by other detectors. A casual test performed during the Auto Editor's daily commute indicates that the most resistant detectors to false alarms are the Escort, Snooper, Cobra, Maxon and GUL.

As you can tell from our test charts,

the Escort and Snooper are sensitive units with superior discrimination. The Cobra, Maxon and GUL are, to put it kindly, not among the best performers.

Some of our test detectors are literally clones—the same electronics with slightly different styling sold under a different name. Specifically, the Cobra Trapshooter, Road Patrol XK, Road Alert 30 and Uniden RD-9 are seemingly identical. However, as you can see from our test results, their performance varies significantly. Some of this can be attributed to assembly line variations, or perhaps to differing specs for different marketers.

Our test was done using an X-band MPH Industries K-55 and K-band Kustom Electronics Falcon, among the most popular handheld



police radar guns.

Out on the highway, when you're nudging the national speed limit, what you need is a warning beep that can be heard above the radio and gets you to tap the brakes *now*. One tester's "annoying noise" was often another's "attention-grabbing beep." We suggest you only buy a detector you can return, just in case its audio warning drives you crazy or proves to be inaudible.

Every detector also has an array of lights to provide a visual warning. It's important that you be able to tell the difference between X- and K-band signals instantly, without looking away from the road. While rarely used on the open expressways because of their short range, K-band radar gives little warning to even the best detectors. A K-band signal requires immediate action on the part of a motorist, but the relatively high-powered X-band units will often give a mile or more of notice.

Signal strength indicated by flashing lights and beeping tells you how close you are to Smokey, and helps to sort out false alarms. On many units, one or two warning lights and a lazy "peep" indicate faraway fuzz or some X-band pollution from alarms, and other sources. More lights and faster beeps mean "watch out!" Any full-bore alarm

DETECTOR PERFORMANCE RANKING

X-BAND	K-BAND	OVERALL
1. ESCORT	1. ESCORT	1. ESCORT
2. PASSPORT	2. PASSPORT	2. PASSPORT
3. UNIDEN, SNOOPER, QUANTUM	3. SNOOPER, UNIDEN, QUANTUM, SPECTRUM	3. SNOOPER, UNIDEN, QUANTUM
6. GUL		6. SPECTRUM
7. SPECTRUM, ROAD PATROL	7. COBRA, ROAD PATROL	7. GUL, COBRA, ROAD PATROL
9. COBRA	9. GUL	
10. ROAD ALERT, MAXON	10. ROAD ALERT, MAXON	10. ROAD ALERT, MAXON

with no preliminary buildup means you've just been zapped by the "instant-on" radar. If you hit the brakes immediately, you may escape detection—police radar won't lock onto an accelerating or decelerating object, only one moving at a steady speed. Just remember not to collect the traffic behind you when you cram on the binders. A ticket beats an accident any day.

Until recently, all false alarms were on the X-band. Now, Rashid Radar Safety Brakes for heavy trucks also operate on the K-band. Only Escort, Passport and a new GUL model (not the one we tested) have circuitry that claim to screen out Rashid false alarms. Right now, only a relative handful of 18-wheelers are equipped with the Rashid collision warning system. But as more of them hit the road, you'll need a detector that can tell radar and Rashid apart.

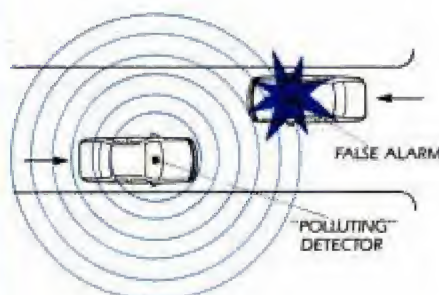
That's why we did this test.

PM

RADAR DETECTOR SOURCES

■ **BEL Micro-Eye Quantum** (\$330), BEL-tronics, Ltd., 20 Centre Dr., Orchard Park, NY 14127, (800)341-2288; in New York, (716)662-0522.
 ■ **Cobra Trapshooter Micro** (\$300), Dynascan Corp., 6500 W. Cortland St., Chicago, IL 60635, (800)262-7222.
 ■ **Escort** (\$245) and **Passport** (\$295), Cincinnati Microwave, Inc., One Microwave Plaza, Cincinnati, OH 45249-9502, (800)543-1608.
 ■ **GUL G300S** (\$260), GUL Industries, 23970 Craftsman Rd., Calabasas, CA 91302, (800)423-3538.
 ■ **Maxon RD-1** (\$100), DAK Industries, Inc., 8200 Remmet Ave., Canoga Park, CA 91304, (800)325-0800.
 ■ **Micronta Road Patrol XK** (\$200), Radio Shack, Tandy Corp., 1700 One Tandy Center, Fort Worth, TX 76102, (817)390-3300.
 ■ **Snooper D-4000** (\$180), MSI, 116-32 Chairman Dr., Dallas, TX 75243, (800)442-3574.
 ■ **Sparkomatic Road Alert 30** (\$230), Sparkomatic Corp., Routes 6 and 209, Milford, PA 18337, (800)233-8831.
 ■ **Uniden RD 9** (\$270), Uniden Corp. of America, 6345 Castleway Ct., Indianapolis, IN 46250, (317)842-0280.
 ■ **Whistler Spectrum 2** (\$330), Whistler Co., 5 Lyberty Way, Westford, MA 01886, (617)692-3000.

CAR-TO-CAR INTERFERENCE



"POLLUTING" DETECTOR

...TRIGGERS FALSE ALARMS IN:

	QUANTUM	COBRA	ESCORT	GUL	MAXON	PASSPORT	ROAD PATROL	SNOOPER	ROAD ALERT	UNIDEN	SPECTRUM
QUANTUM						*			*		
COBRA				*		*					
ESCORT	*	*		*	*	*		*	*	*	
GUL		*			*	*		*		*	
MAXON		*	*			*	*		*	*	
PASSPORT		*			*	*		*	*	*	
ROAD PATROL		*		*		*		*		*	
SNOOPER				*	*						
ROAD ALERT		*				*					
UNIDEN	*			*				*			
SPECTRUM											

The modern world is filled with microwave radiation. According to the experts, up to 25 percent of all radar tickets are erroneous, mostly because the same airport radar, motion detectors, CB transmitters and garage door openers that set off false alarms in your radar detector can also trigger Smokey's radar.

Superheterodyne radar detectors produce their own low-level microwave radiation, which can trigger false alarms in other detectors. Instead of Smokey, you can be picking up nothing more than your fellow commuter.

We tested for false alarms by bringing every combination of detectors bumper-to-

bumper. As you can see from the chart, compared to last November's, the pocket-size detectors are more prone to false alarms than their full-size counterparts. They also emit more spurious radiation, thus causing more false alarms. The cleanest detectors are Snooper and Spectrum when either giving or receiving radar rumors.



WE HAVE A WINNER!

A California reader drives off with a Nissan Hardbody V6 in our Customize-This-Truck contest.

Drum roll, please. And the winnah is: Larry Wood, who claimed the Nissan Hardbody 4x4 King Cab SE and drove it back to California, the American epicenter of automotive passions. Larry qualifies to design outrageous custom cars by dint of designing Hot Wheels toys for Mattel for the past 18 years.

Larry's entourage of vehicles includes a rear-engined sidewinder Buick V6 '34 Ford street rod, a '32 Nash, a 429-powered '46 Caddy for daily driving, and a 1913 Harley-Davidson which he keeps in the living room. They really do that kind of thing out in California.

Larry does all of the work on these toys himself, (except for the chrome and paint). So he's certainly ready to



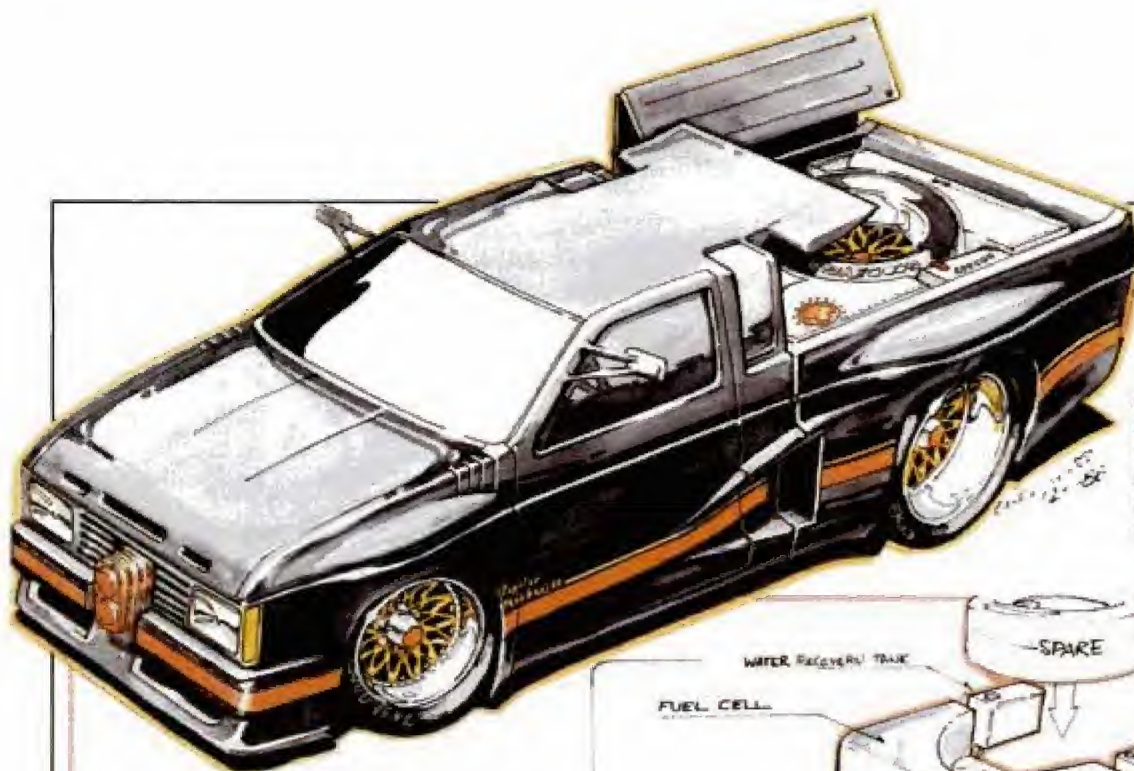
Larry Wood accepts Nissan keys from Editor-in-Chief Joe Oldham (right) and PM Publisher Dan Coleman.

perform the radical customizing he's suggested for his new Nissan. "Living in car-crazy California there are enough big-wheeled, 4wd mini-trucks to jam the freeways," says Larry. "They hardly make heads turn anymore. Everyone seems to be driving them. Seems that the hi-buck, hi-tech sports car is the

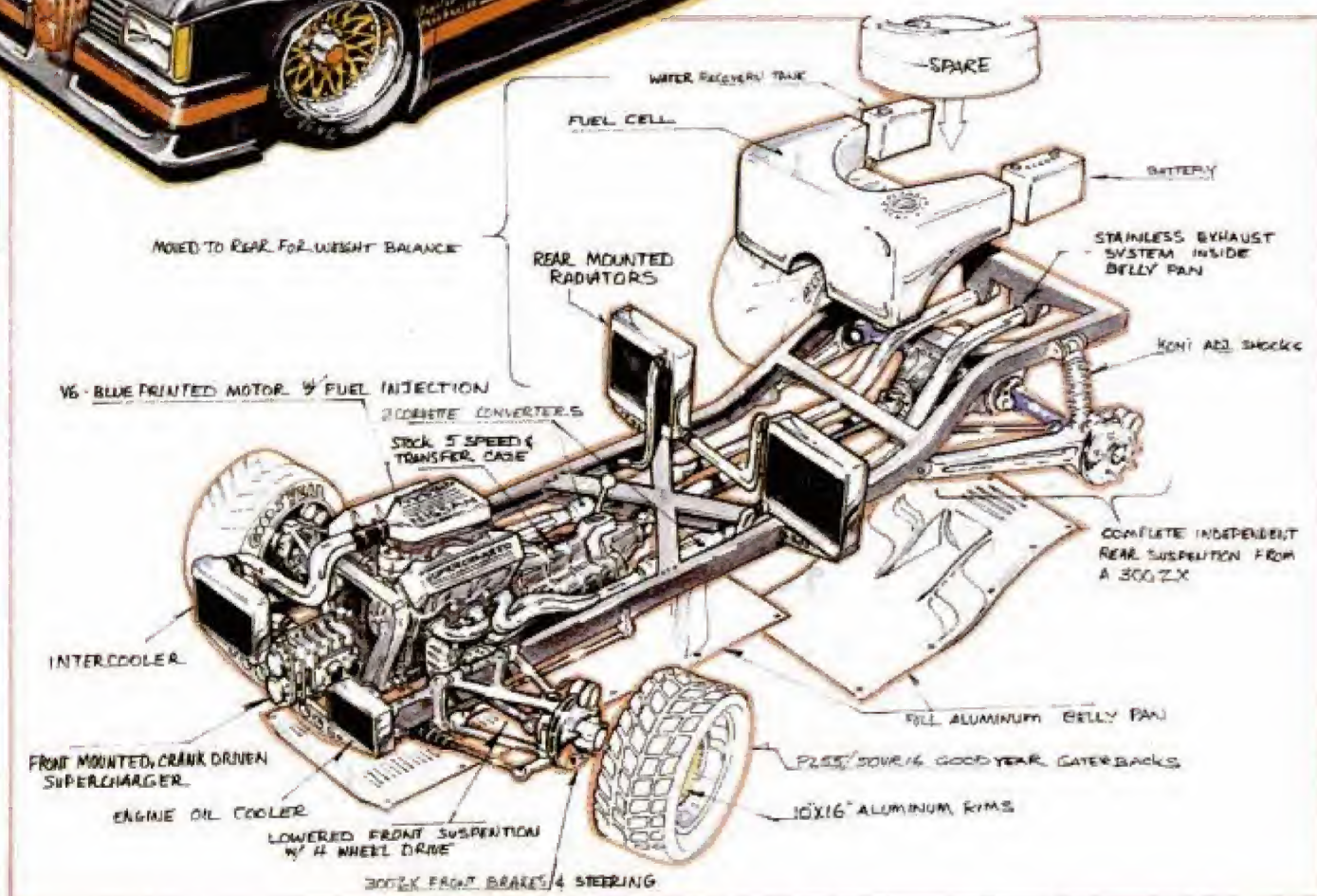
rage here now. Everywhere you look there are Porsches, Audi Quattros, Ferraris. So why not a pickup that has the look, power and handling of the sports set?"

Larry specified a blue-printed Nissan V6 motor, even though a lot of entrants insisted on the last standby of the hot-rodder—a small-block Chevy. Larry wants to supercharge and intercool the 3-liter V6 with the crankshaft-driven blower mount-

ed low and protruding through the grille. Moving the radiators, battery, spare and fuel cell to the rear will help with front-to-rear weight balance, and 300ZX rear suspension and brakes give 4wd independent suspension. A full belly pan should clean up the aerodynamics on the bottom of the truck,



Winning entry sports supercharger, intercooler, 300ZX rear suspension and plenty of other custom touches. Winner Wood says he could get this truck on the road, modified to his specifications by next summer. It'll be just the thing for chasing parts for his stable of wild vehicles. Not to mention blowing off a lot of sports cars on the boulevards.



complementing the NACA duct, air dam, wind and aluminum bed cover "to help keep traction when we get alongside a Ferrari on Highway 1 through Big Sur."

Larry's well-planned graphics treatment complements the hi-tech ground-effects style built into the bodywork. Note how it accentuates the radiator intakes flanking the bed.

Larry claims, "I could easily build this very trick truck in my own garage and be

looking good by next summer. Wanna go for a ride?" You bet!

We got hundreds of entries that suggested the only thing the Hardbody needed to complement its 140 hp V6, 5-speed transmission, alloy wheels, light bar and trick paint job was a set of personalized license plates belonging to the winner.

While the people from Nissan were impressed with that kind of testimony to the product they sell, that's not

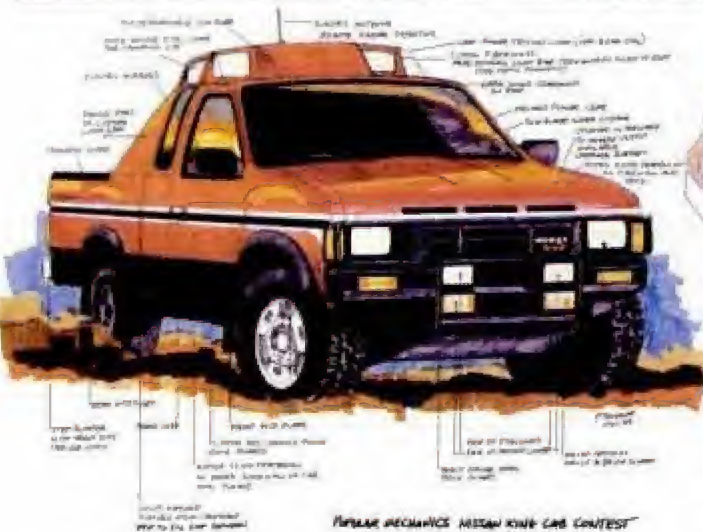
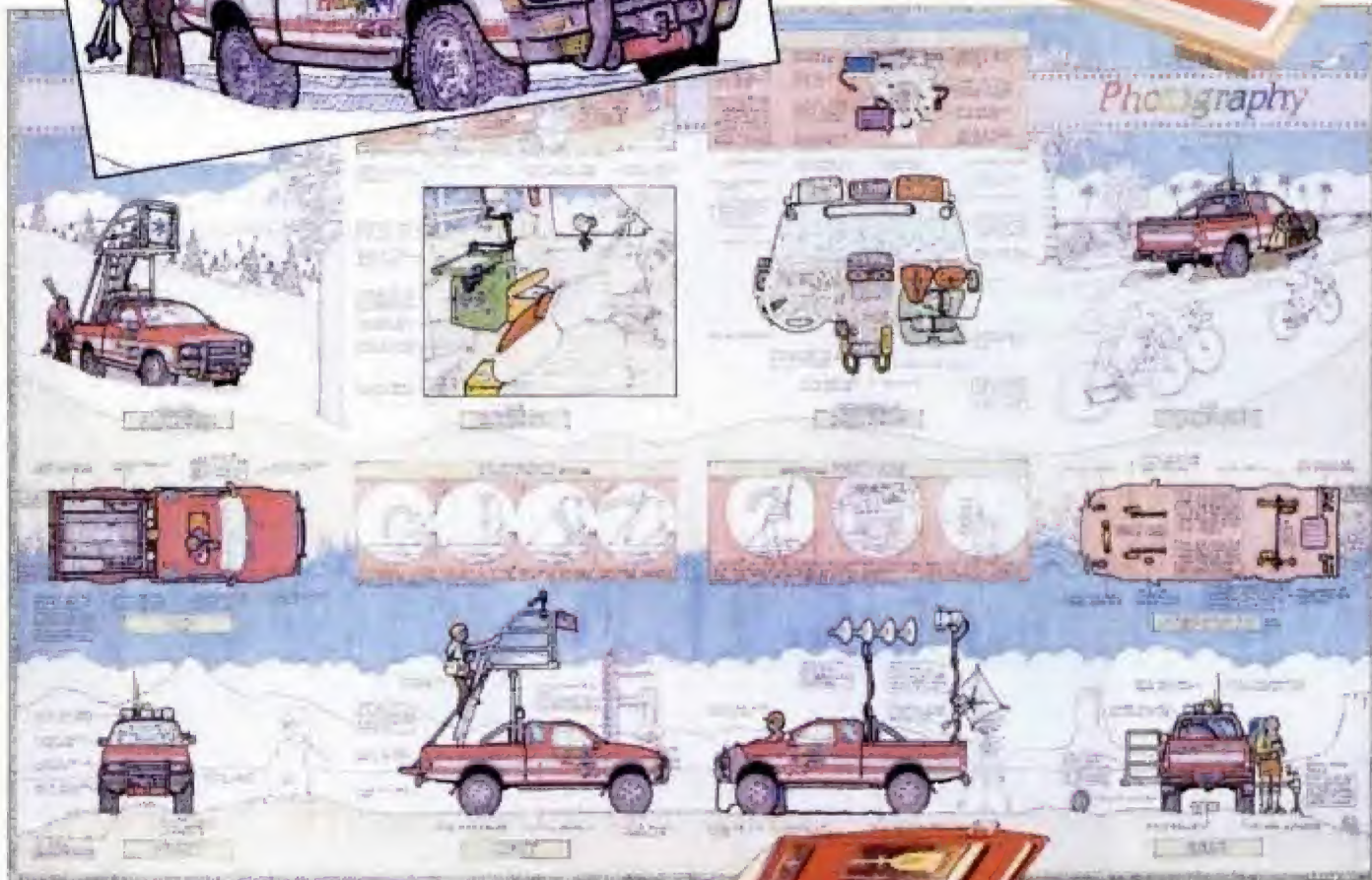
how to win a "Customize-This-Truck" contest. Final determination of the winner was made by Editor-in-Chief Joe Oldham from the finalists that Assistant Auto Editor Mike Allen had selected.

Some other entries, besides the ones shown here, are worthy of mention. If you'll recall, the picture of the Hardbody we used in the original story announcing the contest in the August '86 issue was reversed. Several sharp-eyed readers brought

that to our attention, although some others sent such faithful drawings of the truck that they copied the reversed "SE" letters on the door still reversed.

There were a good number of entries that called for that old standby of the hot-rodder—flames. While certainly attention grabbing, we were looking for something a trifle more contemporary. Ditto for the entry showing the waterbed in the back.

FM



Other entries include working diorama (top right) built by Victor Buccola from Louisiana. Drawings top left and center of page are from Roger Margulies of California. Details of his photographer's do-all support truck include camera tower, side-mount platform, light box, developing chamber, John Reilly of Yonkers, New York, designed a pickup cap that doubles as a fishing dinghy (above). Design (left), submitted by Peter E. Solomon of Glen Ellyn, Illinois, is embellished with streamlined light bar on cab roof.

POPULAR MECHANICS NISSAN KING CAB CONTEST

MUSCLE

Five of America's hottest sport boats lock horns in a classic performance battle.

If you want to go fast and look good doing it—but not deplete your bank account—the current fleet of mini-offshore machines, scaled-down imitations of the triple-engined Cigarettes and Magnums, provide eye-popping speeds at less than eye-watering prices.

They're called muscle boats and there's a lot to like in these downsized wave busters besides power, speed and sexy lines. When it comes to rough-water performance, there are few similarly sized boats in

their league. The sharp entry of the deep-vee hull gives an incredibly smooth ride in most models, even when blasting through seas that would hammer you into a mass of Jell-O in other designs.

What's more, you stay dry while navigating the rough stuff. Strakes and hard chines surrounding the wetted surfaces keep water away from the cockpit at all speeds. And despite the fact that you're ripping along at close to a mile a minute, the low seating position and wraparound windshield keeps wind blast



BOATS

BY FRANK SARGEANT, Photos by Skip Gandy

to a minimum. On the downside, these boats don't have a lot of cockpit space. They're all engine compartment and bow, and the cuddy cabin is little more than crawl space on most.

But space is not what these boats are all about. Would you complain that a Ferrari isn't roomy? This is not to say you can't overnight on a muscle boat—you could, if dockside washrooms were close by.

These boats are built for racing; and the PM test team gave them plenty of it, wringing out five of the

sleekest midsize hulls on the market during sessions at Mercury Marine's Mercabo test facility near Placida, Florida. Two additional entries from Four Winns and Chris-Craft (see *Point . . . Counterpoint* on page 154) were included in the performance analysis, but major differences in standard power and amenities placed them out of any valid comparison.

The five boats we eventually charted were supplied by Donzi, Wellcraft, Sea Ray, Chaparral and Formula. Sterndrive power for each was MerCruiser's



Sprinting for the horizon, from center and moving clockwise: Wellcraft Scarab I, Thunderbird Formula F206 LS, Donzi Z-21, Chaparral Villain III, Sea Ray Pachanga 22.



Thunderbird Formula F206 LS: Nicely balanced profile and quick.



Chaparral Villain III: Surprisingly stable rough-water ride and

sole, for example, where a hatch fits neatly over an insulated cooler. There are also lockers in the cabin to hold a fair amount of overnight gear.

Seating at the wraparound console was comfortable, but the bucket seats could be deeper to provide better support during high-speed turns. We found the seat hardware a bit light for the job, too.

The windshield is tempered safety glass in an aluminum frame, providing excellent, distortion-free visibility. All gauges are easy to read from the helm position, and the padded sport wheel is ideal for tight maneuvers.

Sea Ray cleverly opened up the cuddy access via a door that stretches across the entire port side of the console—an impressive improvement over the low crawl space provided in most other boats in this class.

impressive 350 Magnum, a 270-horse fire-breather that pulls extra power from a big GM block via high-rise intake manifolds. They were tuned to perfection by Merc's Test Center professionals. The drive system for each boat was MerCruiser's beefy Alpha One, one of the toughest stern-drives in the business.

Despite hours of prop tinkering to squeeze the last fraction of speed from each, we found some significant differences in performance among the five essentially similar muscle boats.

Sea Ray Pachanga 22

The Pachanga 22 won the hearts of the test team for several reasons. First, its striking lines and spaceship dash made it look as if it was traveling 100 mph while still tied to the dock. Second, when the lines were untied, it lived up to its looks, with significantly higher top-end speeds than the rest of the fleet. And when it came to the performance course—a saltwater run with a pair of hairpin turns—the Sea Ray also came on strong, with tracking so tight that G-forces threatened to flatten the test crew permanently.

The boat also had more storage than any of the others, partly due to clever use of space. There's a cutout in the

TEST PARAMETERS

Each boat was equipped with a 270-hp MerCruiser 350 Magnum feeding power to the prop through an Alpha One stern-drive. Props were chosen for maximum speed on each boat. Top-end and acceleration figures are the result of averaging four test runs for each boat with two adults aboard. A Decatur radar gun was used for speed tests, while timing was accomplished with a St. Charles stop watch.



OVERALL RANKING/MAKE/MODEL	1. SEA RAY PACHANGA 22	2. WELLCRAFT SCARAB I
LOA/Beam/Deadrise/Weight/Fuel Capacity	22'/96"/22°/3135 lb./63 gal.	21'/96"/20°/3100 lb./60 gal.
Cockpit: (sq. ft.)	14.44/Cozy but more than adequate	20.37/Easy movement fore and aft
Sunpad: (sq. ft.)	17.26/Smallest in the fleet	24.44/Spacious but access blocked by radar arch
Cabin: Useable volume (cu. ft.)	8.02/Also on the small side and extremely dark	10.29/Roomy but difficult entry/egress
Sleeping Pad: (sq. ft.)	37.9/Merely average	43.6/Moderate size but comfortable and well lighted
Stowage: (cu. ft.)	55.06/Copious and extremely well laid out	23.5/Adequate but hardly substantial
Seating Space	5+/Plush, secure and comfortable	6/Not uncomfortable; solidly built
Hull Construction: (see key)	HLU RT, Wd/FG SS, Inj. PU	1 LY CR, 3 LY WR, Wd/FG SS
Top-end Speed: (mph)/Ranking	58.23/1/Sets the pace	57.18/2/Solid performer
Acceleration 0-40: (sec.)/Time/Ranking	10.17/3/Moderate but still spritely	9.98/2/One of the quickest
Performance Course: (sec.)/Time/Ranking	51.95/2/Tremendous cornering, tight steering	51.52/1/Excellent tracking; slight porpoise
Fit-and-Finish: Ranking	1/Striking graphics, excellent use of space	2/Top-quality hardware throughout, plush interior
Price as tested	\$29,395	\$29,270
Address	2600 Sea Ray Blvd., Knoxville, TN 37914	1835 Whitfield Ave., Sarasota, FL 34243

Hull Construction Key: HLU=Hand Layup; LY=Layer; M=Mat; CR=Chopped Roving; WR=Woven Roving; FM=Fatmat, comb. mat & roving; CM=Chopped-strand mat; SS=Stringer System; Wd=Wood; FG=Fiberglass Reinforcement; Inj.=Injected; Spr.=Sprayed; PU=Polyurethane Foam Flotation; RT=Ray Tech, comb. of laminates & fiberglass; TXC=Tri-Axial fiberglass & Coremat

Perfect symmetry between wheel, gauges, seat and throttle position. Unhindered sight lines from helm.



Switch access and mounted compass make sense. Wheel doesn't interfere with gauges. Seats secure.





Sea Ray Pachanga 22: Extraordinary speed and spritely handling.

Wellcraft Scarab I

The Scarab, which many consider to be the progenitor of the popular high-performance boat, is still the boat to beat in this class. It ran a very close second in top speed and bested the Sea Ray Pachanga 22 in acceleration and in the performance course.

The Scarab's appearance is exceptional and the fit and finish are top notch. But the entry to the cuddy cabin requires contortions that most of us can't perform comfortably. And the racy-looking radar arch makes it tough to get to the sunpad on the stern. Further, at higher rpm the test boat displayed a slow but annoying porpoise. And we found a rough ride in choppy waves at speeds more than 30 mph.

The windshield, trimmed low to match the line of the boat, is not high enough to deflect wind—and worse, the frame runs directly across the line of sight of the driver. Also, the seat control at the helm sticks out into the walkway between the two forward chairs just far enough to bark the shins of an unwary skipper.

These points aside, however, the Scarab I is a dynamic speed machine. Every fitting in the boat is high-grade marine quality and battleship tough—Bomar Marine hatch-

(Please turn to page 153)

exceptional stability at top speed; inexpensively packaged.

One shortcoming in the cabin is the lack of hatches to provide ventilation for overnighting. The Sony stereo in the dash has speakers in the cockpit and in the cuddy, both giving exceptional sound quality.

The powerlift engine hatch is foam padded and does a good job of keeping engine noise down, but it seemed a bit flimsy and had a tendency to wobble during raising and lowering. The swim platform contains the muffled exhaust exits, which are smooth looking and reasonably quiet.

Sea Ray has a special fiberglass layup process for its Pachanga hull, which it likes to keep close to the vest. They call it Ray Tech and, roughly, it consists of a combination of laminates and woven roving. No chopped roving is used.

The Pachanga 22 is a standout sport boat in so many ways that we had to make it our number one choice.



3. THUNDERBIRD FORMULA F206 LS	4. DONZI Z-21	5. CHAPARRAL VILLAIN III
20'6"/94"/22"/3190 lb./43 gal.	22'6"/101"/22.5"/3375 lb./56 gal.	22'/96"/22"/3325 lb./65 gal.
17.93/A real tight squeeze	19.18/Tight but still adequate	33.33/Voluminous
18.69/Average but more than adequate	21.45/Larger than most	19.32/Average but adequate
9.53/Solid but unremarkable; lacks vents/hatches	9.63/Average; headroom extremely limited	9.69/Difficult entry/egress
38.13/Comfortable	45.25/Extra beam helps in this category	38.75/Too thin; extremely uncomfortable
27.69/Side pockets highly appreciated	8.07/Totally inadequate	44.47/Exceptional space well used
5+/Deep bucket seats forward adds to security	6/Generally pretty Spartan	6/Uncomfortable; does not feel well built
Combination WR & CM, Wd/FG SS, Inj. PU	HLU TXC, Wd/Tri-Ax SS, Spr. PU	3 LY WR, 1 LY CM, Wd/FG SS, Spr. PU
54.48/5/Slowest, prop suspected	56.08/3/Reasonably quick; loud due to side exhaust	55.2/4/Average
9.63/1/Quickest here; skiers take note	10.39/4/Average	10.57/6/Way off the pace
54.47/5/Sloppy steering; slides on corners	53.59/4/Excellent rough water ride; tracks well tuning	53.14/3/Stable at speed; outstanding in rough water
3/Excellent seating; plush sleeping area	4/Minimalist approach; racing heritage evident	5/Nice upholstery, but detailing decals nick easily
\$31,725	\$36,995	\$27,748
18100 Biscayne Blvd., N. Miami, FL 33160	P.O. Box 987, Tallahassee, FL 32370	P.O. Drawer 928, Nashville, GA 31639

Elbow rest aft of throttle particularly appreciated in rough water. Gauges somewhat condensed on instrument panel.



Offset wheel hard to get used to. Racing controls mean vital trim function is located out of the way.



Wheel severely restricts view of instruments. But switch and throttle are positioned for comfort and access.





BY STEPHEN A. BOOTH, Electronics Editor,
and FRANK VIZARD, Contributing Editor
Photos by Brian Kosoff

Smuggling isn't the usual way PM goes about getting electronics gear for test stories. But in the case of digital audio tape (DAT) technology, we felt like we were trafficking contraband when we acquired a recorder purchased at retail in Tokyo and carried through U.S. Customs to our lab. Why the intrigue? Because DAT recorders are facing a ban on importation in proposed legislation before Congress.

Digital audio tape (DAT) promises to be the music medium of the future. It renders sound quality on a par with digital compact discs, but in a smaller package. Moreover, DAT provides the opportunity of digital recording to hi-fi enthusiasts—a feature which the playback-only CD lacks. This very asset



Available only in Japan now, Sharp's RX-X100 digital audio tape recorder has controls and displays similar to today's conventional analog decks. But the cassette itself (inset) is half the size of current tapes, and stores 2 hours of music.

EXCLUSIVE TEST REPORT

DIGITAL AUDIO CASSETTES: SMALL TAPE, BIG SOUND

The first digital audio cassette recorders have just hit the street in Japan. Here's how they compare to the compact disc.



might prevent DAT decks from reaching American homes. The proposed embargo is prompted by the music industry's contention that DAT makes mirror-image copies of CDs, and that this ability will precipitate revenue-robbing private copying and criminal piracy.

Our theoretical understanding of DAT, and our instincts, told us this contention is uninformed and unfounded. Indeed, DAT can sound splendid—but it doesn't make bit-for-bit clones of CDs any more than today's conventional analog cassette decks do. Here's the story.

The DAT recorder

The DAT deck we obtained, Sharp's RX-X100, sells for about \$1300 in Japan. So do comparable machines from Aiwa, Hitachi,

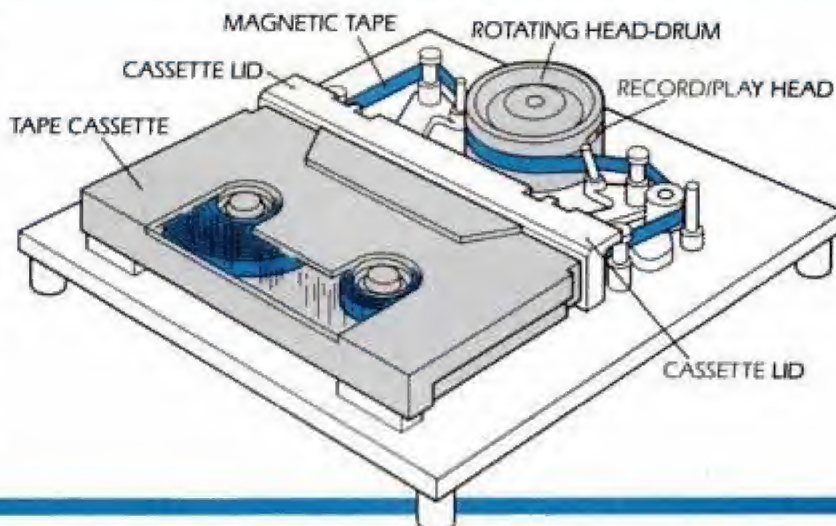
JVC, Mitsubishi, Sony and Toshiba. Tape costs about \$13 for a 2-hour cassette. Both prices should drop dramatically as production increases. The deck measures the same size as most other hi-fi components, but the DAT cassette is half the size of today's analog cassettes.

Sharp's RX-X100 is loaded with controls and features—many of them similar in function to those on analog decks. Operationally, we found the DAT recorder to be both familiar and strange. Though its front panel sports the recording controls of a conventional deck, the tape transport system resembles that of a videocassette recorder.

DAT—HOW IT WORKS

Digital audio tape's transport system (right) works just like that of a videocassette recorder. Once inserted in the deck, the cassette's protective lid opens and the tape is extracted and wrapped 90° around the head-bearing drum. As the tape moves past the drum from left to right at $\frac{1}{2}$ in. per second, the drum rotates counterclockwise at 2000 rpm (middle right). This combination yields a recording speed of 123 in. per second—65 times faster than today's analog cassette decks. Because the tape is held at an angle to the drum in a helical pattern, the drum's two magnetic heads write and read information in diagonal tracks across the width of the tape instead of longitudinally along its length, as in analog recording (far right). This space-saving arrangement provides two hours of information on a matchbox-size cassette. Because each of the two heads is mounted at a different azimuth, the information-bearing tracks are laid down in an alternating pattern.

TRANSPORT SYSTEM



And, of course, the machine shares the digital storage format with CDs. In actual recording, this entails different parameters than those we've become accustomed to with analog decks. We'll elaborate on this later.

Like a VCR, the DAT recorder requires a few seconds for the tape to exit the cassette and load into the record/play tape transport system. Also like a VCR, it will disengage the tape and enter the Stop mode if the transport is left in Pause for an extended time.

The functional similarity to a VCR is most apparent when accessing individual tracks on the DAT cassette. Like VCRs that reverse up to 15 units on the tape counter before moving forward in the Play mode, the RX-X100 first overshoots the desired selection by 28 units, swiftly rewinds to the 8-unit mark, then counts down to zero—at which point the music begins.

The tape's fast-advance and rewind speed is awesome—200-times normal playback speed. That's not as fast as the access time between selections on a CD, but it's more than 12 times faster than an analog deck.

Just like CD, the deck gives you direct access to each music track. Simply punch in the selection number (even by remote control) and the tape speeds to the designated point. You can program selections to play in any order you like.

Helical recording

The reason DAT acts like a VCR is because it shares the same helical-scan recording scheme. The type of digital cassette deck available today is called R-DAT, for Rotary. Just like a VCR, the DAT deck's magnetic heads are mounted in a rotating drum that "writes" data in diagonal tracks

across the *width* of the tape—instead of longitudinally along its length, as in fixed-head analog decks. Though the tape in an R-DAT deck moves at only 0.815 centimeters per second (about $\frac{1}{2}$ in. per second), the head-bearing drum rotates at 2000 rpm. This yields a *writing speed* of 3.133 meters per second, or 123 in. per second.

That's fast compared to analog cassette decks, which record and play tape at $1\frac{1}{2}$ in. per second. Consequently, R-DAT provides two hours of record/play time on a matchbox-size cassette. The tape measures the same $\frac{15}{100}$ in. wide as today's analog cassette tape. But the use of a high-density metal formulation permits more information to be stored.

At the standard record-speed stated above (there are two optional schemes), R-DAT decks sample the music at a rate of 48kHz (48,000 times per second)

and assign each sample of 16-digit code comprised of ones and zeros. Though the sampling rate differs from the 44.1kHz used for CDs, theoretically, the results are just as good. DAT yields flat frequency response from 4 Hz to 22kHz (beyond audible range) with an impressive 96 dB (decibels) of signal-to-noise ratio. The best analog cassette decks weigh in around 75 dB. CDs, by the way, are limited to 75 minutes of music storage.

Sampling variance

DAT records at 48kHz and plays back tapes sampled at that rate. But the machines also have a playback sampling rate of 44.1kHz—just like CD's—for prerecorded DAT cassettes that music companies might or might not sell.

What DAT doesn't have is the ability to record at the 44.1kHz sampling rate.

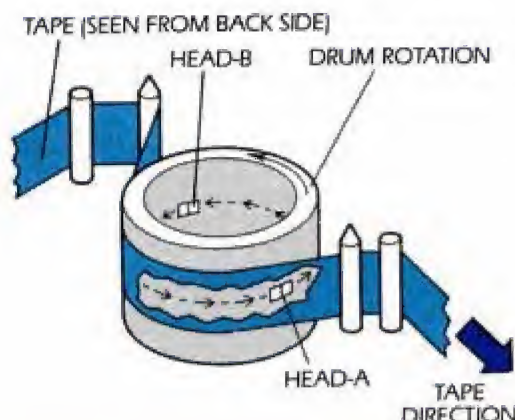
This means a CD can't be copied in direct, digital form, because the machine has no way to convert the incoming 44.1kHz signal for recording at the 48kHz sampling rate. Therefore, the digital signal emanating from a CD must first be converted to an analog signal (within the CD player) which is then re-recorded digitally by the DAT machine.

Even if the CD player has direct digital outputs (some do) and the DAT player has direct digital inputs (some might), the disparity in sampling rates would still prevent direct cloning. Even the improbable insertion of a sampling-rate converter between the two components would not work. That's because most CDs are inscribed with a Copy Prohibit code. This code triggers a mechanism already built into every DAT deck that prevents the machine from recording the encoded material.

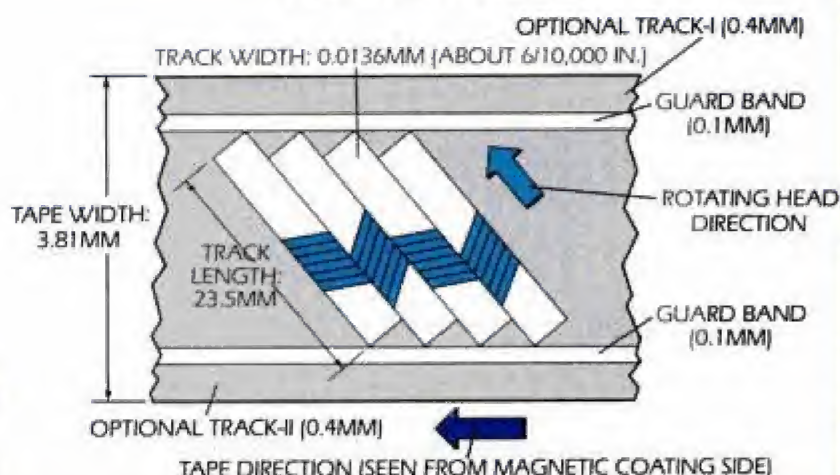


DAT cassette (left) is half the size of today's analog cassette, yet holds two hours of sound. Though tape is same $\frac{15}{100}$ in. wide, it uses a high-density metal formula.

ROTATING HEAD



TRACK SCHEME



The DAT deck's inability to make direct digital-to-digital dubs is intentional. It represents an attempt on the part of hi-fi manufacturers to address the music industry's concern that DAT decks will facilitate widespread copying, either for personal use (in car DAT players) or for criminal trafficking in bootleg dubs. The music industry remains apprehensive, and is lobbying for the incorporation of an anticopying device that would prevent the recording of CDs in any manner. (For more on the legal aspects and car stereo applications of DAT, see this month's *Electronics* and *Audio* columns.)

Hands-on!

While politicians debate the propriety of home digital recording—or any home recording at all—our practical experience with DAT indicates it's far from

the clone-maker some think it to be.

Because digital-to-digital recording isn't possible, the input signal must pass through an analog stage. The quality of the analog electronics will determine how good a signal the DAT deck will record, but some deterioration is inevitable, possibly in frequency response and definitely in signal-to-noise ratio. You can think of this like the process used to make a photo print, with the CD's digital signal being the negative. If direct digital recording were possible, the DAT copy would be a print made from the negative. But because the CD's signal must be converted to analog before recording, the DAT dub has the imperfect resolution of a print made from a print.

Besides this signal deterioration that is inherent to the recording chain, our experimentation with the RX-X100 in-

dicates that the recording process itself will introduce the factor of human error to the equation—and thereby further diminish the quality of the dub.

Flying blind

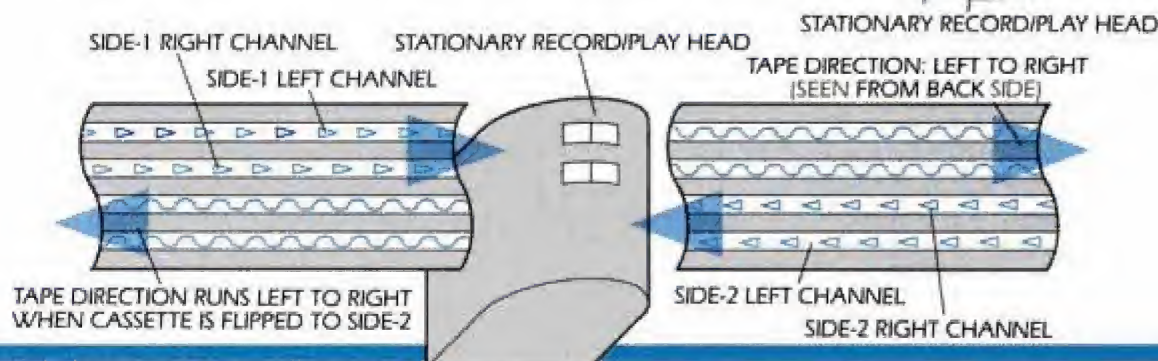
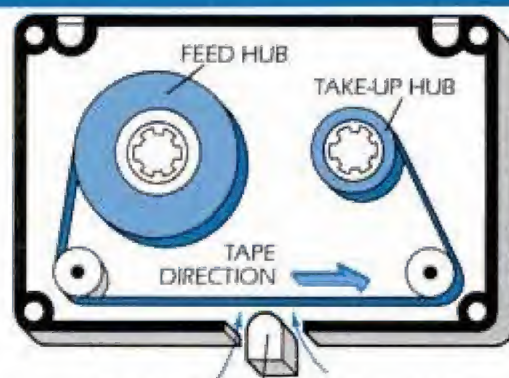
As with analog cassette recordings, the DAT dub's fidelity to the original depends a great deal upon the skill of the person whose hands are on the controls. Though the DAT deck's input-level dials and displays are the same as those on analog decks, it's harder to make a good digital dub. This is partly because of the digital-recording process and partly because of the deck itself.

Unlike analog recording, digital is quite precise and doesn't leave room for error—especially the error of recording at too high an input level.

When you record an analog cassette, (Please turn to page 155)

ANALOG CASSETTE—HOW IT WORKS

In analog cassette recording, a nonrotating fixed head enters the housing to press against the tape. The tape passes by the head at 1½ in. per second, and separate tracks for the left and right stereo channels are recorded simultaneously along the length of the tape. When the first side is recorded, the cassette is flipped to record a second set of stereo tracks on the remaining width of the tape. In DAT recording, just like videotape, there's no need to flip the cassette.





'HOW I BOMBED QADDAFI'

There were three terrorist actions that ultimately drew U.S. Air Force F-111Fs to Tripoli, Libyan Arab Republic, on the night of April 15, 1986. The first occurred on December 17, 1985, when Palestinian gunmen attacked innocent travelers at the Rome and Vienna airports. The Libyan leader, Muammar al-Qaddafi, hailed the action, declaring that he "had the right to export terrorism to America."

Further, on March 24, 1986 Libyan armed forces fired several SA-2 and SA-5 surface-to-air missiles at U.S. Naval aircraft flying over international waters above the Gulf of Sidra. Finally, on the night of April 5, 1986, a bomb planted in Berlin's La Belle discoteque exploded, killing a U.S. serviceman. Berlin police failed to connect Libyan agents with the bombing. But U.S. government communications intercepts concluded that Qaddafi was responsible for the atrocity, the same man who had supported terrorists throughout Europe and the Middle East.

The fate of the Libyan leader became intertwined on the night of April 15 with that of a 43-year-old U.S. Air Force colonel—the author of this article. The American flier was piloting the lead F-111F in an 18-plane Air Force strike force assigned to bomb military targets in Tripoli, the Libyan capital. One of three squadron commanders, the colonel delivered four 2000-pound laser-guided bombs to Qaddafi's headquarters at the El-Azziziya barracks, adjacent to the Bedouin tent where Qaddafi often resides.

The Air Force colonel is an intense but amiable southerner who holds a master's degree in laser physics. He agreed to relate his personal experiences during the Tripoli Raid on the condition that he not be identified, an obvious security consideration. The colonel's Navy counterpart on the raid also agreed to an interview under a similar request for anonymity. Their tales of precision aviation in an electronic age bear all the complexity of neurosurgery, with references to night-vision video, forward-looking infrared radar, bomb-run inserts and terrain-following techniques. The discussions produced the following new information about

A personal account of an American blow against terrorism.

BY A U.S. AIR FORCE COMBAT PILOT

America's most significant air-combat mission since Vietnam: • Groups of three F-111Fs were assigned a "mother tanker" for the 5600 nautical-mile flight, which were, in turn, refueled. In fact, the colonel hooked up 11 times during

the long night mission to Libya. • The Air Force fighter/bombers observed strict radio silence prior to the strike, even during refueling. Hence, the joint Air Force/Navy operation was choreographed completely by careful timing. • The F-111F that was lost, resulting in the deaths of Major Fernando Ribas-Dominicci and Captain Paul Lorence, may have been hit by any number of Libyan defensive systems, or they may have hit the water inbound to the target while trying to outmaneuver a Libyan missile. There is no evidence that any U.S. aircraft were struck by ground fire. • The Libyans employed the most sophisticated air defense ever encountered in the history of U.S. air combat, firing a full array of SA-2, SA-3, SA-6, SA-8 and French CROTALE surface-to-air missiles. • Due to strict rules of engagement, designed to limit damage to nonmilitary targets, at least one F-111F crew fought through the missile batteries to their target, only to discover an electronic malfunction. Because they couldn't guarantee that their bombs would not damage civilian areas, they fought their way back out to sea and dropped their ordnance in the water. • Only two F-111Fs were assigned to strike Qaddafi's barracks/office in the El Azziziya compound in downtown Tripoli. Our author insists that the notion of assassinating the Libyan leader was never discussed by mission planners or strike participants. "Qaddafi personally wasn't the target," he says. "I say that absolutely, categorically, because it was not the mission's objective."

In the aftermath, American aircrews quietly bore the brunt of public opprobrium for "collateral" damage suffered in the Libyan capital (inevitable "in the fog of war," according to the author). But there have been no significant terrorist acts in Europe or America since the night of April 15, 1986. Unfortunately, it's too much to hope that Qaddafi has been silenced.—The Editors

As we came up on the coast, I remember thinking, I'm flying the first airplane across the target. We'd had detailed mission planning involving many, many airplanes. But everything was coordinated off the timing of the launch back in England.

So if the EF-111s didn't get to their

Multiple refuelings of the fleet of F-111Fs was important part of the mission.

station on time, we were going to be sitting ducks. If the Harm and Shrike (antiradar missile) shooters from the Navy weren't firing their missiles on time, I wasn't sure how many planes we would lose. If the air crews weren't flying the ground track they were supposed to be flying, there was a high probability that they would hit each other because our TOT [time on target] was really compressed to saturate the Libyan defenses.

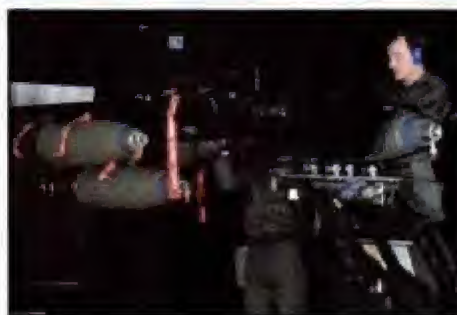
We were completely com-out on our way to the target—no radio communication whatsoever. I had no idea whether the Navy had launched. I had no idea whether anybody was where they were supposed to be.

The first time I ever saw or heard another airplane was 40 seconds prior to my bomb release, when I looked up and saw a Navy A-7 firing a Shrike at a radar emitter. And boy, that gave me a warm, fuzzy, good feeling inside.

'HOW I BOMBED QADDAFI'

Target: El Azziziya Barracks

The adrenalin was up, maybe the heart rate too, but the chatter between me and the weapons system officer (WSO, or "wizzo") was pretty businesslike. I was worried that I wasn't flying fast enough to maintain timing. I was worried about the wind not being in the direction it was supposed to be in. I was worried about the wizzo finding his radar offset point, which would later help him find the main barracks at El Azziziya. It was absolutely paramount that he find it, so there was obviously a lot of pressure on him. And there were only a few seconds to find the target because we were very low to the ground. He moved the Pave Tack pod [forward-looking infrared radar] to the last few feet of refinement and he had to turn the laser on the target to guide the bombs in. He had his hands full while I was maneuvering the airplane. It was on auto pilot—and my hands and feet were completely off the controls—but I had my hand on the throttles the whole time to adjust air speed. When the wizzo got squared away, I pulled the nose up in what we call the Pave Tack Toss, where you loft the bomb, then descend back to low level to egress. In



PM PHOTOS BY GEORGE HALL

F-111Fs (top) were chosen because they could deliver heavy ordnance in any weather. Above, ground and air crews from the Statue of Liberty Wing go through preflight checks.

the meantime, the wizzo started guiding the four bombs into the target. They come off the airplane almost simultaneously. He was saying, "I've got it. Come on. Impact. Big Time."

Then all hell broke loose. Just as he was guiding the bombs into the target, a ZSU anti-aircraft weapon opened up. It's a Triple A gun, 23mm, four barrels,

very effective. I could see the tracers coming up at us from about our seven o'clock position.

At that point, the wizzo said our bombs had made impact so I descended to low level to get back over the water. It was then that I made my one and only radio call of the raid on our strike frequency: "Feet wet," meaning we

OPERATION ELDORADO CANYON



(1) Twenty-four F-111Fs of the 48th Tactical Fighter Wing fly the mission from Lakenheath, United Kingdom. Each aircraft is equipped with Pave Tack Forward Looking Infrared Radar and each group of three is accompanied by a KC-10 tanker. Six spare aircraft return to base as planned, and of the remaining 18, five have various technical problems and do not drop ordnance. (2) The remaining aircraft strike the El Azziziya Barracks (headquarters for Libyan leader Muammar al-Qaddafi), Tripoli Military Airport, and the Janzor Naval Barracks at

Sidi Bilal. (3) Aircraft carriers Coral Sea and America launch F/A-18s, A-6Es, EA-6Bs, A-7Es, F-14s and E2-C Hawkeyes. All Navy aircraft return safely after strikes (4) at Benina Airfield, missile aiming sites and Al Jumahlirja Barracks outside Benghazi. The entire mission is flown in strict radio silence at flight levels below 200 ft. Pilots who agreed to exclusive PM interviews said the Libyans offered the toughest anti-aircraft defense in history, including batteries of SA-6, SA-8 and SA-13 surface-to-air missiles.

The Navy's Raid On Benghazi

The naval aviator who agreed to an exclusive interview with *POPULAR MECHANICS* flew the new F/A-18 strike fighter off the Libyan coast—the type's first combat mission. His reaction when he saw a Soviet-designed missile headed in his direction?

"It looked like a Saturn 5."

This whimsical allusion to the giant rocket that delivered men to the moon masked the real concern the aircrews had about the inten-

the latest crop of Navy pilots, particularly those who went in "over the beach" after Libyan forces had been alerted.

"There were very few combat experienced pilots on the Benghazi raid. The fact that we hit the targets accurately and got everybody back safely is a testament to the new generation.

"The key was the fact that we'd been in the theater for two to three months and we had looked at various contingencies. During that

craft carriers relied on both high-speed transits and "the complete electronic spectrum" to elude Soviet escort ships.

Launch was a very closely controlled exercise under total radio silence. EA-6B Prowler jamming aircraft and E-2C Hawkeye early-warning aircraft provided support, while the F/A-18s and A-7Es fired Harms and Shrikes for the A-6E attack force. F-14s, assisted by the dual-role F/A-18s, flew fighter cover but no Libyan aircraft got off the ground. KA-6 tankers—A-6s converted for refueling—kept the Navy armada in the air.

A-7Es firing Shrike antiradar missiles flew cover for the F-111Fs during the raid on Tripoli. Every movement of every Navy airplane was precisely timed according to when the F-111Fs released brakes and started their takeoff roll back at Lakenheath.

"There was only one radio transmission as we headed into the Benina Airfield target. We issued an alert as to what missiles would be in the target area. There had been a lot of pre-strike publicity in the press, and the Navy had had a significant presence in the area for several months prior to the raid, so we were surprised that the Libyan defenses weren't more alert. Everything around Benghazi was lit and there was minimal activity.

"For the A-6 drivers and weapons systems officers who had to deliver the bomb loads, it was extremely tough. They were working very hard to, No. 1, not hit the ground, and No. 2, get to the target and get to the right target.

"Obviously, they had a lot of anti-aircraft fire and SAMs to avoid. In that position, you're incredibly busy and it's distracting when people are shooting at you. Time seems compressed, and 15 minutes seem like 15 seconds to the guys in the cockpit."

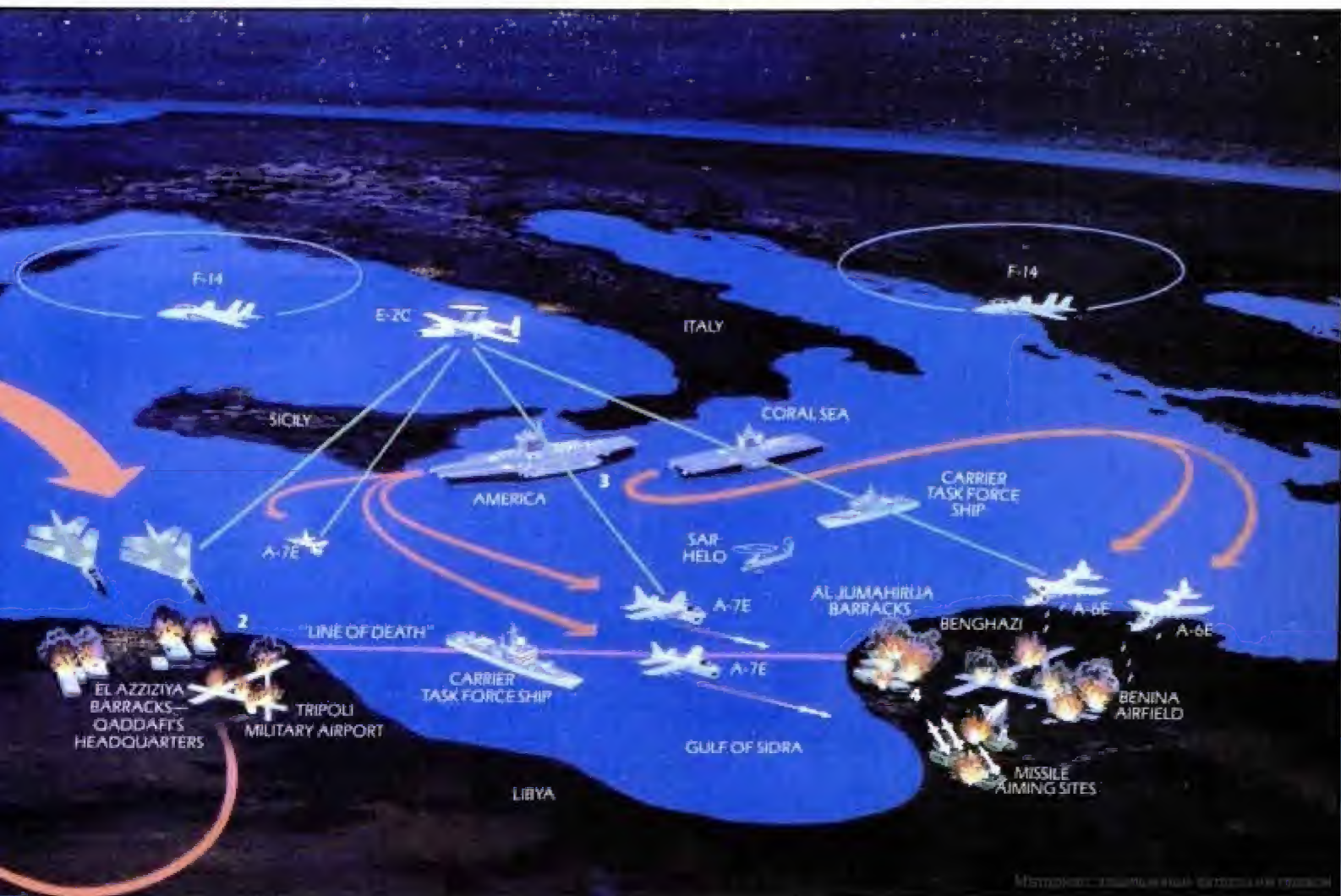


Swing-wing Navy F-14 Tomcats and E-2C Hawkeye airborne early-warning platform flew cover for both the Air Force Tripoli raid and the Navy strike on Benghazi.

sity of the Libyan ground fire. These were the pilots who demolished the Al Jumahirija Barracks and attacked Benina Airfield with Rockeye cluster bombs, destroying several aircraft on the ground. The Navy pilot personally fired Harm antiradar missiles at Libyan aiming sites, denying ground forces a chance to take a bead on the A-6E all-weather penetrators as they completed their bomb runs.

The F/A-18 jock had nothing but praise for

time, we'd encountered MiG-25s and SU-22s, so we were pretty familiar with the tactical situation. And the A-6 crews were familiar with the area and were highly trained." He said the Navy strike at Benghazi was accomplished primarily with a careful mix of power and tactics: The entire Air Wings of both the Coral Sea and America were involved on a mission that began with a "dash for the launch point" from north of Sicily. The naval aviator said the air-





Post-strike intelligence showed damage to Soviet aircraft at Benina Airfield, Benghazi (top left). The Navy strike also completely destroyed a military barracks in the Benghazi area (far left). A Mk 82 500-pound bomb from an F-111F failed to deploy near the Tripoli Military Airport (near left) probably when the bomb's parachute retard system failed. Strike videos (above) show destruction of Soviet IL-76 Candid transports at Tripoli Military Airport.

were heading back out to sea.

It was also at this point that I saw an F-111F hit the water at around my nine o'clock position. He was along the attack axis, and he may have seen a missile coming at him. At night, whenever a missile is fired, it always looks like its coming straight at you. So he may have maneuvered abruptly to try to avoid it and hit the water in the process. I don't know. I just know they hit the water, creating a ball of flame that looked like napalm.

And I knew I'd lost some friends.

Preparations

I'd had a tour and a half in Southeast Asia, but I had forgotten what seeing casualties felt like. When you went into a combat zone like Vietnam, you knew months ahead of time and you had a chance to think about it, had a chance to say goodbye to friends and family.

It was a lot different, a lot tougher, in a noncombat environment like Lakenheath. On Sunday everything was fine, and you were with your family. But on Monday, you had to report for work at 2 in the afternoon knowing that that night you were going to launch a combat mission. It was very difficult to deal with. As a squadron commander, I was very close to the families and I had helped pick the crews.

Of course, crew selection was an important element during the planning phase prior to the strike. This was a

classic F-111F mission in that the task required heavy bomb loads and night, all-weather penetration. Early on, during early contingency planning in January of '86, our assumption was that we'd be able to fly across France. But in those early days, we were much more focused on a possible attack at specific targets. We had no idea that we might have to fly all that distance.

Once it became clear that we'd have to fly around the Iberian Peninsula, refueling became a prime consideration. Still, we didn't want one aspect of the mission to be what we call a show-stopper. In other words, we didn't want one thing to cause the entire mission to be in jeopardy. And there's one thing that people have learned over and over again: If there is anything that's going to get messed up, it's going to be a rejoin with a tanker. So I wanted to take off from Lakenheath, join a tanker as soon as possible, and I didn't ever want to have to leave that tanker until the drop-off point near the target. The mother tanker could then be refueled by yet another tanker. Other mission planning included target selection, and what ordnance to carry. We eventually decided on four, 2000-pounders per aircraft for El Azziziya Barracks and the terrorist training camp at Sidi Bilal, and 12 500-pounders for the Tripoli Military Airport. It all came down to the final 72 hours before the strike when we put together last details with

the SAC crews who flew the tankers, then filed into the theater for a briefing by General Westbrook, the wing commander. He said a few things in a motivational kind of way. I gave a last-minute briefing on the weather. Then there was a stir and Gen. Charles Gabriel, chief of staff of the Air Force, came up to the stage for a little chat with the guys. He told us how important the mission was. And I thought, Jesus, we're really going.

Gen. Gabriel also asked if anybody had any questions. It's ironic, but Fernando asked the last question. He wanted to know when we were going to go back to Libya for a second strike. Fact is, Fernando never left Libya.

Regrouping for home

But I had no idea who had gone down as we flew back out through the Navy shield and started to gain altitude. I had to find that damn tanker. The F-111F has an absolutely outstanding ground radar, but it doesn't have a very sophisticated air-to-air radar. So we were concerned about that.

We had a predesignated orbit point, or rendezvous point, so we had no problem when we went back to using our navigation system. Still, there was one airplane in our group that was having difficulty finding the tanker for the rejoin. I heard him telling the tanker that he couldn't find us and we made

(Please turn to page 153)

SHOPWORK

Guide



In This Section:

- Torsion-Box Workbench
- Portable Power Tool Table
- Roll-Around Small-Parts Storage Cabinet

We've all seen photos of great shops with fine tools hanging on the walls and a floor plan crowded with high-end stationary equipment. These workshops are beautiful to be-

hold and the source of many a wonderful dream. But they are usually very expensive and, therefore, out of reach for most of us.

In hopes of redefining the concept of a *dream shop*—into something more practical and affordable—we brought together the considerable talents of Associate Editor Thomas Klenck and Contributing Editor Rosario Capotosto. The result is a 3-piece ensemble that includes a torsion-box workbench, a portable power tool table and a roll-around small-parts storage cabinet. Not only are these

pieces innovative and affordable, they also store very compactly when not in use, occupying less than 23 sq. ft. of floor space.

The individual merits of each are discussed in the following pages, but as the centerpiece, the tool table demands a special word here. Because it can accommodate a full range of portable power tools, thus providing many of the benefits of stationary equipment, it represents a real breakthrough. We will publish a second story showing the astounding capabilities of this piece in our September issue.—S.W.

Benchmark

How to build a flat, stable workbench for your shop.

BY ROSARIO CAPOTOSTO, Contributing Editor

In the old days, the construction of a workbench was a project that demanded all the skills of the accomplished cabinetmaker. Well-dried hardwood stock for the top had to be carefully joined and surfaced to be flat and true. Because a good workbench top acts as a guide and reference for all the objects to be built in the shop, the supporting framework would be braced against racking and strong enough for the heaviest work. And, to give the bench the weight it needs to stay put, heavily dimensioned stock would be used throughout.

For most home craftspeople, the expense of the wood alone would be enough to deter them from making a quality workbench. Add to this the time and effort necessary for preparing and joining the heavy stock without expensive machinery, and it's no wonder that most workshops make do with a sometimes rickety, and often inadequate, work surface. Our workbench was designed to overcome all these problems—with a few add-

ed attractions to boot.

Designed around a torsion-box top, this bench is economical to make and, with a little care, will rival the best traditional benches for flatness and strength. Further, because it's not solid wood, it will stay flat. It can be built using portable power tools and con-

structed of commonly available materials. The hefty legs are designed to eliminate the need for a complicated framework while





Packed into a less than 23-sq.-ft. floor area, our workshop ensemble includes power-tool table, small-parts cabinet and a workbench that sets the standards for quality woodworking. The bench features a heavy-duty vise, bench dogs and replaceable work surface. The power table and cabinet roll out on locking casters and all three are trimmed with hard-wearing maple.

Workbench design: Thomas Klenck
Color photo: J.R. Rost
Black-and-white photos: Rosario Caporotito
Technical art: Eugene Thompson

Benchmark

adding great rigidity. This means the space underneath is completely open for roll-away storage—a feature impossible to find on conventional benches. Heavy-duty levelers allow you to adjust the bench to any floor. And, on top, there's a replaceable, hardboard work surface. This bench also features the Record 52½D quick-action vise, bench dogs and long-stock support pin in the front leg opposite the vise.

The most interesting feature, however, is the torsion-box top which, simply, is a structure designed to resist twisting and bending loads. It's constructed by sandwiching a square-grid structure, or eggcrate, between two sur-

faces much the same way that hollow-core doors are made. You end up getting maximum strength with minimum materials. Of course, the flatness of a torsion-box depends entirely on the flatness of the surface that it's assembled on. So, you'll have to begin by preparing an absolutely flat surface on your basement or garage floor. This step is time consuming, but the results make it all worthwhile. First, you'll need to lay down a series of softwood cleats which can be trued up for accurate assembly.

Preparing for assembly

Unless you have a wood floor that you can screw the cleats to, fasten them down with double-faced tape. Make sure you get tape with sufficient holding power. Scotch Mounting Squares will do the job. They come in packets of

16 1-in. squares and are available at most stationery and hardware stores.

Start by drawing an outline of the benchtop on the floor. Use a large framing square and an accurate 7-ft. straightedge. You'll need seven cleats to support the top assembly. Cut each cleat to 30½ in. Mark seven equally spaced cleat locations along the benchtop outline. It's a good idea to lay masking tape around the outline to make your pencil marks easier to see. Number the cleats and cleat locations. Each cleat will be tailored to fit one specific location and you don't want to mix them up.

Most workshop floors are not flat enough to fasten the cleats to without first scribing them to the contour of the floor. Place the first cleat in position at one end of the benchtop outline. Place a level on top and shim the cleat until the



1 Prepare a flat assembly surface by securing leveled cleats to the floor. Scribe each cleat to fit surface irregularities.



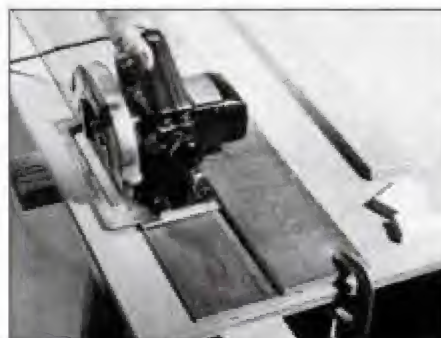
2 The inner cleats are trued by spanning the end cleats with a straightedge. Mark the correct height on each inner cleat.



3 Check the assembly surface to be sure it's absolutely flat. If necessary, fine tune the cleat upper edges with a plane.



4 Use a spacer block and straightedge ripping guide to accurately rip the plywood for the webs and inner aprons.



5 Rip enough stock for all the webs to identical width. Then crosscut to length, making sure that the cuts are square.



6 Hold benchtop components in place with pipe clamps and drive one staple at each web joint. No glue is needed.



7 Using a long straightedge, transfer the eggcrate pattern to the panel top to be used as a guide when driving the nails.

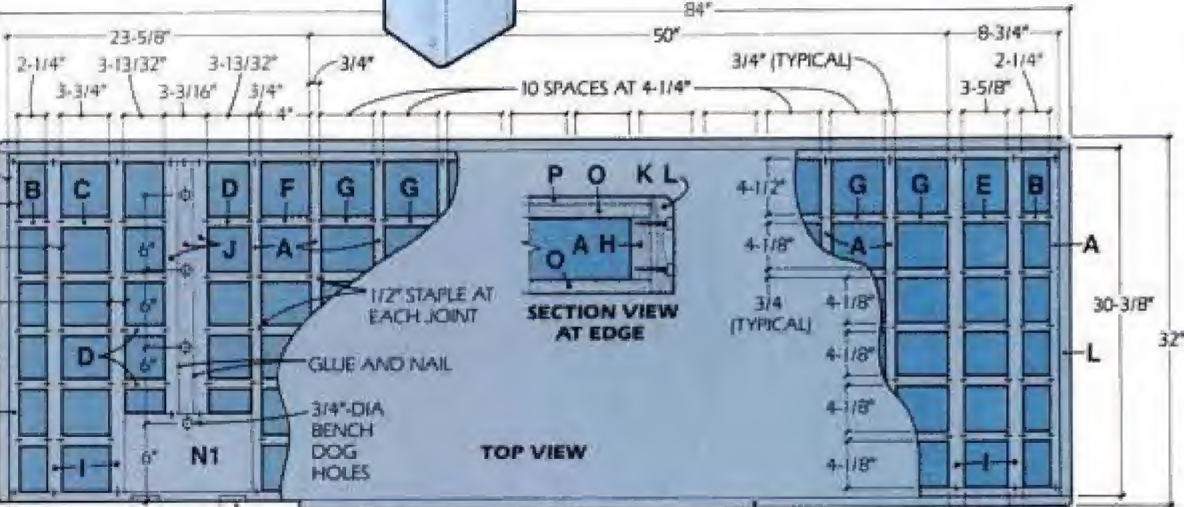


8 After one side of the eggcrate is stapled together, check for square, and apply slow-setting hide glue on all edges.



9 Instead of using clamps to hold the panel in place while the glue sets, drive finishing nails between each intersection.

32" WIDE X 34" HIGH X 84" LONG



Benchmark

bubble centers. Scribe the contour of the floor on the lower edge of the cleat and cut to the line. When placed back in position, this cleat should now be level. Now cut the cleat for the opposite end (No. 7) in the same way and fasten both down with three adhesive tabs each.

Next, scribe and trim the remaining cleats to fit the floor at their correct positions. Don't worry about leveling these at this point. Place cleat No. 2 in position and temporarily secure it with the tabs. Cut three spacers (about 1/4 in.) and place one of them on the end of the first cleat and one on the end of cleat No. 7. Lay your long straightedge on these spacers and use the third spacer

to scribe the correct height of cleat No. 2. Repeat this on the other side of the benchtop outline. Then remove cleat No. 2, connect the marks with a straight line, and trim to this line. Repeat this procedure for the remaining cleats and then, lay them all in position and check them with the straightedge. When you're satisfied that the top edges of all the cleats are true and flat, fasten them down with adhesive tabs.

Building the benchtop

Start construction of the benchtop by cutting the plywood webs. Use a straightedge ripping jig to cut the webs straight and to the same width. Then cut the maple webs to size and prepare the vise support block as shown in the drawing. Cut the long inner aprons to size and rout the recesses for the maple

inserts. These inserts accept the front lagscrews that hold the vise. Finally, cut the top and bottom particle board panels about 1/4 in. oversize.

Lay one of the panels on the cleats and temporarily fasten it in place with four 4d finishing nails. Position the inner aprons and the end web pieces and use pipe clamps to hold them together. Now begin assembling the eggcrate pieces fastening each to the next with a staple driven across the joint. No glue is necessary. The staples only serve to hold the pieces in place until the box is completed.

Next, mark the remaining panel with the grid pattern as reference for nailing. Run a bead of slow-setting hide glue on the top edges of the eggcrate and lay the panel in place. Drive 4d finishing nails between each intersection to clamp the panel in place. Allow

MATERIALS LIST—WORKBENCH		
Key	No.	Size and description (use)
A	13	1/4 x 2 1/2 x 25 1/2" lauan plywood (long web)
B	10	1/4 x 2 1/2 x 2 1/2" lauan plywood (web)
C	5	1/4 x 2 1/2 x 3 1/2" lauan plywood (web)
D	8	1/4 x 2 1/2 x 3 1/2" lauan plywood (web)
E	5	1/4 x 2 1/2 x 3 1/2" lauan plywood (web)
F	5	1/4 x 2 1/2 x 4" lauan plywood (web)
G	50	1/4 x 2 1/2 x 4 1/4" lauan plywood (web)
H	2	1/4 x 2 1/2 x 82 3/8" lauan plywood (apron)
I	4	1 1/16 x 2 1/2 x 28 3/8" maple (web)
J	3	1 1/16 x 2 1/2 x 22 3/8" maple (bench dog web)
K	2	1 1/16 x 3 1/4 x 84" maple (apron)
L	2	1 1/16 x 3 1/4 x 30 3/4" maple (apron)
M	2	1/4 x 2 x 2 1/2" maple (insert)
N1	3	1/4 x 6 x 10" plywood (vise block)
N2	1	1/4 x 6 x 10" plywood (vise block)
O	2	1/2 x 30 3/4 x 82 3/8" particle board (top)
P	1	1/4 x 30 3/4 x 82 3/8" hardboard (top)
Q	2	1 1/2 x 5 1/2 x 28 1/2" maple (cleat)
R	4	1 1/2 x 5 1/2 x 28 1/2" maple (crossmember slab)
S	12	1 1/2 x 5 1/2 x 29 1/4" maple (outer leg piece)
T	4	1 1/2 x 5 1/2 x 21 1/2" maple (inner leg piece)
U	4	1 1/2 x 4 x 28 3/4" maple (crossmember inner rail)
V	4	1 1/2 x 7 1/4 x 19 1/4" maple (crossmember outer rail)
W	4	1 1/2 x 3 1/2 x 5 1/2" maple (leveler support)
X	8	1 1/2 x 2 x 5 1/2" maple (support cleat)
Y	2	1/2 x 3 1/4 x 9 1/4" plywood (vise pad)
Z	1	1" dia. x 12" dowel (stock support)
AA	80	2" No. 12 fh screws
BB	28	1 1/2" No. 12 fh screws
CC	108	1/2" dia. plugs
DD	28	3/4 x 3" lagscrews and washers
EE*	4	6" leveling jacks
FF**	1	vise Record No. 52 1/2 D

Misc.*Leveling jacks (No. 91007) available from Armor Products, Box 445, E. Northport, NY 11731 (\$25 postpaid). **Vise (No. 10G04.02) available from Garrett Wade, 161 Avenue of the Americas, New York, NY 10013 (\$102 postpaid).

Build something exciting...



Pegasus A 7-ft. diameter hovercraft, which floats 10 inches off the ground. It's built from plywood and is powered by a 3.5 hp engine that runs nearly 3 hours on a gallon of gas. Plans come complete with drawings and a 32-page photo-illustrated instruction booklet. Great for weekend sports and leisure. (PL-1800—\$9.95)



Tri-Flyer You grab the joystick, twist the throttle grip and suddenly you're flying at speeds over 75 mph on land or water. That's PM's latest high-tech hovercraft, propelled by a 65-hp snowmobile engine that powers a four-bladed fan. Lift comes from a 10-hp mower engine that carries you and two passengers over obstacles and up hills. Plans include six blueprint-size sheets and a 60-page instruction booklet with drawings, photos and building tips. (PL-1805—\$19.95)

Scuba Tow Sel Using a single tiny fishing motor, this scuba tow glides you along at a leisurely 3 miles per hour. Use it with or without scuba gear; it'll work on the water's surface or below. Plans include full-size cutting pattern and an illustrated instruction manual. (PL-1747—\$10.95)



TO ORDER:

Send your name and address with check or money order to: **POPULAR MECHANICS**, Box 1014, Radio City Station, New York, NY 10101.

Popular Mechanics is a publication of Hearst Magazines, a division of the Hearst Corporation. © 1986 The Hearst Corporation. All rights reserved.

Benchmark

the glue to set overnight. When the glue is dry, lift off the partially completed torsion box and carefully pry the base panel away from the cleats. Lay the glued-up section face down on the cleats and drive staples at all the joints. Spread the glue and attach the remaining panel. After the glue has dried, use a router with a flush-trimming bit to trim the excess from panel edges.

The support system

Cut the maple ledgers to size and fasten them in place with $\frac{3}{4}$ x 3-in. lagscrews. Be sure they're positioned so the lagscrews enter the maple webs in the benchtop. Next, cut the stock to the



10 When the glue has dried, remove the benchtop and pry up the base panel. Then lay the top, face down, on the cleats.



12 Maple ledgers connect the leg assemblies to the top. Secure these with lagscrews that extend into the maple webs.



14 Glue plugs in the counterbored holes and dress with a belt sander. Then rout a $\frac{3}{8}$ -in. round on the outer leg corners.

correct length and width for the legs. Bore the 1-in. holes for the stock support pin as shown in the drawing.

Fasten the short cleats which hold the leveler support blocks in place before assembling the legs. Clamp the leg pieces together and bore the screw pilot holes and the counterbores for the plugs. Apply glue and assemble the legs as shown in the drawing. Bore a hole in each leveler support block and screw the levelers in place. Then glue the blocks to the support cleats mounted in the legs. Glue the plugs in place and, when dry, dress them down with a belt sander. Then rout the $\frac{3}{8}$ -in. round on the outer leg corners.

Adding the final touches

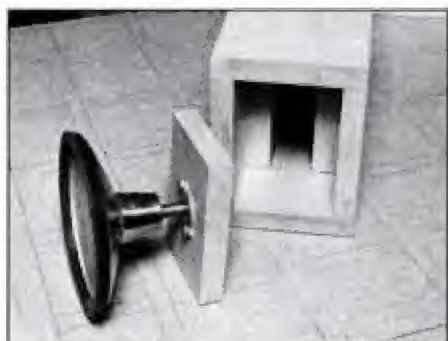
Position the hardboard top leaving $\frac{1}{16}$ in. all around and fasten it down with $\frac{3}{4}$ -in. brads on roughly 8-in. centers.



11 Glue and nail the second panel in place and use a router with a flush-trimming bit to trim the panel excess.



13 Clamp the leg pieces together and counterbore pilot holes for the screws and plugs. Glue and screw together.



15 Screw the adjustable levelers to the mounting blocks and glue the mounting blocks to the support cleats in the legs.

ONE MAN WELL DRILLER

"Easy to Operate!"



SAVE HUNDREDS OF DOLLARS

For less than \$1 per ft. you can drill a water well in your backyard next weekend!

Have all the pure, fresh water you want FREE!

The HYDRA-DRILL drills water wells 50 to 200 feet deep. Easy to operate as a power lawn mower!

FREE
COLOR BROCHURE!

AL, AK, HI, & Outside U.S.:
Call (205) 749-3377

CALL TOLL-FREE

1-800-633-8774

(Ask for Operator 5273)

Or clip coupon and mail TODAY!

DeepRock

5273 Anderson Road
Opelika, Alabama 36802

Please mail your FREE Brochure

Print Name _____

Address _____

City/State/Zip _____

Phone _____

© 1987

NEW

MAGNATAC.
Bulldozer Kit!

LOW-COST
CRAWLER
POWER!

- **NEW ENGINE** - 18 hp Twin Cylinder
- **NEW POWER** - 4500 lbs. Max. Pull
- **NEW LOADER** - Lifts 750 lbs. to 7 1/2 ft.
- **NEW BACKHOE** - Digs & Loads to 8 ft.

Catalog - showing Magnatrac-Kit construction & uses \$1.00

Plans - for building a Magnatrac from local materials \$7.00



SEND TO: STRUCK-KIT Dept: PM77
Cedarburg, Wisconsin 53012

TELEPHONE LISTENING DEVICE



Record telephone conversations in your office or home. Connects between any cassette or tape recorder and your telephone line. Starts automatically when phone is answered. Records both sides of conversation. Stops recorder when phone is hung up.

\$19.95 EACH (by Mail Add)

Super Powerful FM TRANSMITTER



Many times more powerful than other transmitters. Transmits up to 1/2 mile to any FM radio. Easy to Assemble. Kit - up to 9V battery (not incl.)

For catalog of Transmitters, Voice Scramblers and other specialty items, include \$2.00 to USI Corp.

Call 305-725-1000 or send \$19.95 + \$1.00 shipping per item to: USI Corp., PO Box 318-Z, Melbourne, FL 32902 CDD's OK.

Be Your Own Boss ...IN YOUR OWN BUSINESS!

Hundreds we've trained have succeeded in this fascinating and highly profitable profession...
...**YOU Can Do It, Too!**



"No more hard, nasty work for me. Now I have my own business and with hardly any effort I average around \$50 a day. Thanks for my new start in life."
Sam Walker Prichard, Alabama



"I opened my own business, spare time, seven months after I enrolled and made a profit of \$329 for the first week."
B. A. Deberry Littleton, Colorado

"Before enrolling I checked other courses and also asked for advice from several of the professional locksmiths in my area. They all said Foley-Belsaw was tops and has the most versatile Key Machine."

"I always wanted to have my own business and now I do, thanks to Foley-Belsaw."

David Fairbrother—Dave's Locksmith Service
Milwaukee, Wisconsin 53209



Work Part Time, Full Time — Right at Home.

Be a LOCKSMITH!

**Get into this booming high-profit business that's
Easy to learn — Easy to do — Easy on You!**

Never before have money-making opportunities been so great for qualified Locksmiths. Now lucrative regular lock and key business has multiplied a thousandfold as millions seek more protection against zooming crime. Yet there's only one Locksmith for every 17,000 people!

**Make Up to \$26.00 an Hour — even while learning!
Train FAST at Home!**

You're "in business" ready to earn \$10 to \$26.00 an hour a few days after you begin Foley-Belsaw's short-cut training. Take advantage of today's unprecedented opportunities in locksmithing for year-round EXTRA INCOME in spare time — or fulltime in a high-profit business of your own. Hundreds we've trained have done it. So can YOU! All tools plus professional Key Machine given you with course. These plus practice materials and equipment, plus simple, illustrated lessons, plus expert supervision, plus business-building guidance will enable you the KEEP THE MONEY COMING IN! Ideal for retirement — good jobs, too.

SEND FOR EXCITING FACTS—No Obligation

Discover what's in Locksmithing for you — how Foley-Belsaw's master-locksmith-approved training can give you the skill you can depend on to EARN MORE — ENJOY LIFE MORE.

**PRO KEY
MACHINE
YOURS
TO
KEEP!**



This Pro Key Machine can alone add up to \$200 a month to your income... and it won't cost you a penny extra with your training.

YOURS FREE

**30-DAY
NO RISK
TRIAL!**

SEND FOR
FACTS TODAY!

**RUSH
COUPON**

**ALL SPECIAL TOOLS AND
EQUIPMENT INCLUDED!**



FOLEY-BELSAW INSTITUTE

6301 Equitable Rd., Dept. 11198
Kansas City, Mo. 64120

Benchmark

Next, cut the maple outer aprons about 1/4 in. oversize in width and glue and screw in place. Trim the edges with a router and flush-trimming bit. Use a 1/4-in.-rad. rounding over bit to soften each corner of the bench.

Next, turn the bench upside down and place the vise in position to mark the holes for the lagscrews. After the vise is secured, lagscrew the legs to the ledgers. Be sure to check that the legs are square with the bench.

To make use of the retractable dog in the vise, bore 3/4-in.-dia. holes across the bench on the vise centerline to accept a 3/4-in. bolt bench dog. Bore the holes completely through the bench on 6-in. centers. We finished up with three coats of satin polyurethane. Thin the first coat one part thinner to six parts varnish, and use full-strength varnish for the last two coats.

PM



16 After nailing the hardboard top in place, glue and screw the maple outer aprons. Use a router to trim the excess.



17 Place the vise in position to mark the lagscrew holes. These holes extend into the vise support block and inserts.



18 A drill guide helps in boring the 3/4-in. holes for the bench dog. Use a 3/4-in. bolt—threaded end cut off—for the dog.

There is NO OBLIGATION and NO SALESMAN Will Call—ever!

**RUSH COUPON TODAY
FOR THIS FACT-FILLED**

**FREE
BOOKLET!**

Tells how you quickly train to be your own boss in a profitable Sparetime or Fulltime business of your own PLUS complete details on our 30-Day NO RISK Trial Offer!



Send for your
copy today!

FOLEY-BELSAW INSTITUTE
6301 EQUITABLE RD., DEPT. 11198
KANSAS CITY, MO. 64120



☐ **YES**, please send me the FREE booklet that gives full details about starting my own business in Locksmithing. I understand there is no obligation and that no salesman will call.

Name

Address

City

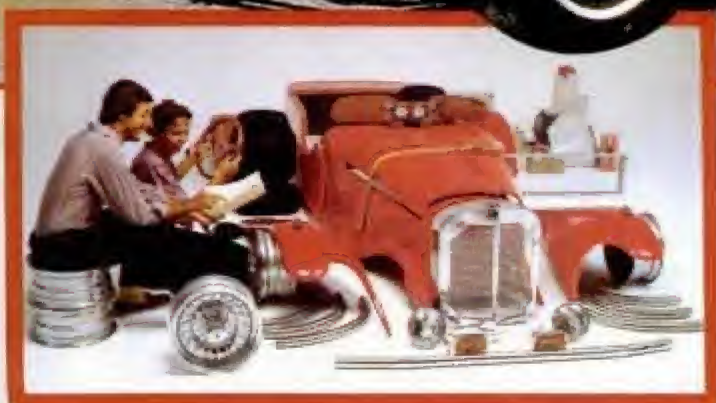
State Zip

We supply the Replicar Assembly, *You Build Excitement!*



Gazelle

Available in front or rear engine drive



Fill out the coupon below and begin the most rewarding experience of your life.



CLASSIC MOTOR CARRIAGES

16650 N.W. 27th Avenue, P.O. Box 10
Miami, Florida 33054, (305) 625-9700
Hours: Mon.-Fri. 9 AM - 11 PM
Sat. 9 AM - 5 PM, Sun. 11 AM - 11 PM

Enclosed is \$1.00 ea. for a full color brochure and consumer buying guide for Replicar assembly:

Gazelle _____ Classic Speedster C _____
Classic TD _____ Classic Speedster _____

Name _____

Address _____

City _____ State _____ Zip _____

Home Phone () _____

Bus. Phone () _____

Please charge on my: ☐ MasterCard ☐ Visa ☐ Am. Exp.

Acct No _____ Exp. Date _____

Signature _____

15-G-7


Why not build it yourself?

In a world filled with conventional automobiles, try an alternative; create your own automotive legend for far less than you might expect. Experience the excitement and pride in being able to say... "I built it myself!"

Classic Motor Carriages is the world's largest manufacturer of replicars and specialty automobiles. Take the challenge now. It's fun, it's easy and it's rewarding. Build your own excitement today!

CALL NOW 1-800-252-7742



CLASSIC 



CLASSIC **SPEEDSTER C™**

©1987 Classic Motor Carriages, Inc. Some equipment depicted is optional

Look for our displays at airports in Amarillo, Baltimore/Washington Int'l, Birmingham, Boston, Chicago O'Hare, Cincinnati, Cleveland, Grand Junction, Jacksonville, Knoxville, LaGuardia, Memphis, Miami, Minn/St. Paul, New Orleans, Newark, Oklahoma City, Phoenix, Pittsburgh, Portland, Reno, St. Louis and Tulsa.

SHOPWORK *Guide*



One For All

This power-tool table gives you stationary-tool performance from your portable power tools.

BY ROSARIO CAPOTOSTO, Contributing Editor

Making your own tools—there's nothing more satisfying to a woodworker. You can customize the tool to your specific needs and save a lot of money. Building stationary equipment, however, is way beyond most of our talents. But we took stock of what is commonly available to home craftspeople—added a little ingenuity of our own—and came up with a versatile stationary power-tool center that can be built easily. Furthermore, our table was designed to be built with portable power tools, the same tools you'll use later to achieve stationary-tool performance. (Note: In our September issue, we will feature an entire story on how to use this innovative table.)

The heart of our table consists of two, octagonal, tool-mounting plates. These self-aligning plates are easily removed for tool adjustment or change. Although we're showing the power table with the circular saw and router, virtually any portable power tool from a sabre saw to a belt sander can be mounted. A sturdy miter gauge allows you to cut angles and the table's ripping capacity, with the

fence, is over 24 in. Best of all, you can have two tools mounted at once to speed multiple machining operations. And when you are done working, you can roll the unit on the heavy-duty locking casters under the workbench for storage.

Construction details

Start construction by cutting the maple stock to width and length for the legs. Bore $\frac{1}{8}$ -in. pilot holes, counterbored for plugs, and glue and nail the leg pieces together. Then prepare the apron pieces for assembly. As shown in the drawing, cut two notches in the center partition to allow for clamp access when securing the rip fence. Bore a $\frac{3}{4}$ -in. hole for the wiring and cut the switch-box cutouts in the front apron. Then fasten the ledgers to the short-end aprons. Temporarily clamp the apron pieces together and counter-bore screw pilot holes for 2-in. No. 12 sh screws. Then install the blocking at the end aprons.

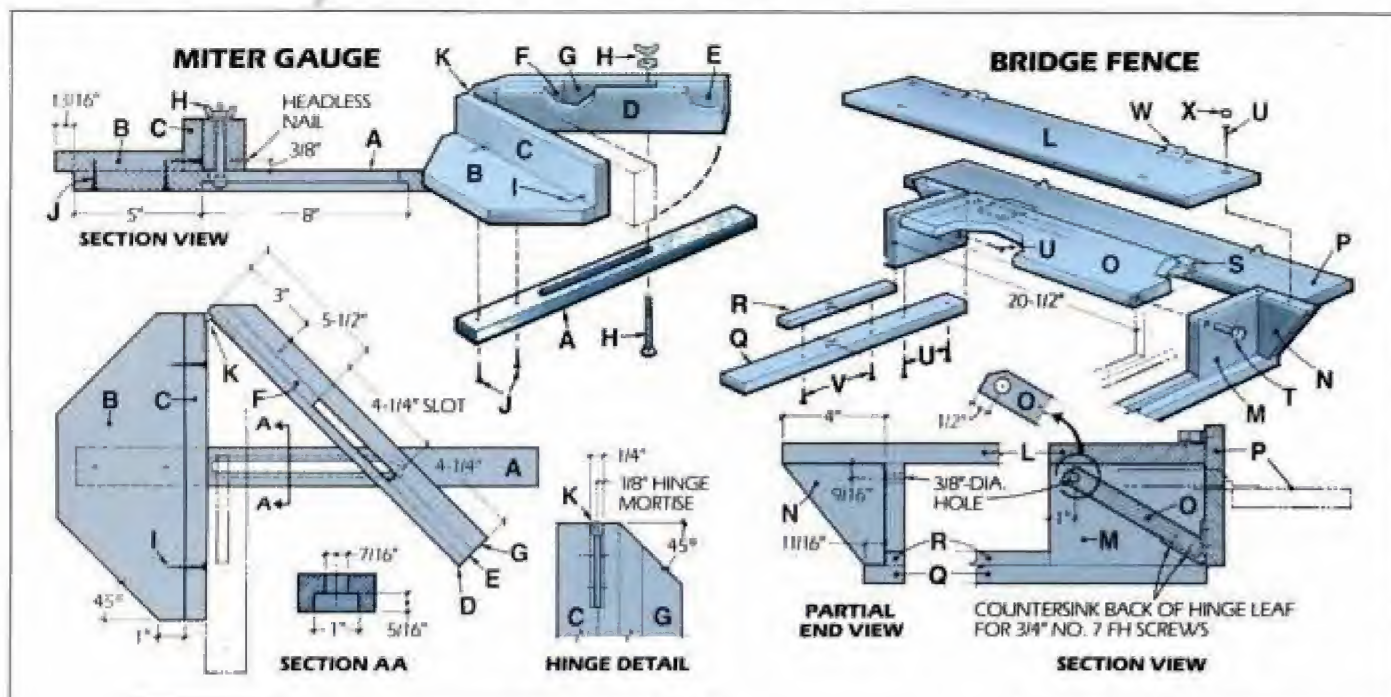
The legs are secured to the frame with dowels. Transfer the dowel locations from the legs to the frame with metal dowel centers. Clamp two blocks of wood at the corner to guide the leg into position and tap with a mallet to mark the centers on the aprons. Bore the dowel holes in the frame corners and glue and clamp the legs.

Tool table design: Thomas Klenck, associate editor
Color photo: J.R. West
Black-and-white photos: Rosario Capotosto
Technical art: Eugene Thompson



Equipped with the miter gauge (left) or rip fence (above), our power-tool table is capable of a host of woodworking operations. Portable power tools are mounted in self-aligning removable plates for quick tool changes and adjustments.





MATERIALS LIST—MITER GAUGE AND BRIDGE FENCE

Key	No.	Size and description (use)
A	1	$\frac{3}{4}$ x $1\frac{1}{2}$ x 18" maple (guide)
B	1	$\frac{1}{2}$ x 5 x 12" maple (plate)
C	1	$\frac{1}{2}$ x 2 x 12" maple (fixed beam)
D	1	$\frac{1}{2}$ x 2 x 14" maple (adjustable beam)
E	1	$\frac{1}{2}$ x 2 x 4 1/2" maple (adjustable beam)
F	1	$\frac{1}{2}$ x 2 x 5 1/2" maple (adjustable beam)
G	1	$\frac{1}{2}$ x 2 x 14" maple (adjustable beam)
H	1	$\frac{3}{8}$ -dia. x 3" carriage bolt,

I	2	washer, wing nut
J	2	$1\frac{1}{2}$ " No. 10 fh screw
K*	1	2 x $3\frac{1}{2}$ " brass butt hinge
L	1	$\frac{1}{2}$ x $6\frac{1}{2}$ x $30\frac{1}{2}$ " maple (top)
M	2	$\frac{1}{2}$ x $6\frac{1}{2}$ x 4" maple (side)
N	2	$\frac{1}{2}$ x 4 x 4" maple (brace)
O	1	$\frac{1}{2}$ x $6\frac{1}{2}$ x $20\frac{1}{2}$ " maple (pivot plate)
P	1	$\frac{1}{2}$ x $5\frac{1}{2}$ x $30\frac{1}{2}$ " maple (fence)

Q	2	$\frac{3}{4}$ x $1\frac{1}{2}$ x 25" maple (guide)
R	2	$\frac{1}{2}$ x $1\frac{1}{2}$ x 15" maple (stop)
S*	2	2 x $3\frac{1}{2}$ " butt hinge
T	2	$\frac{3}{8}$ -dia. x 3" hexhead bolt
U	14	$1\frac{1}{2}$ " No. 10 fh screw
V	6	$1\frac{1}{2}$ " No. 8 fh screw
W	2	roller catch (Amerock)
X		$\frac{3}{8}$ -dia. plug

Misc: *Brainerd No. 8200XC.

Next, cut the two plywood shelves to size. Notch the corners of the top shelf to fit around the legs. Prepare two shelf-support cleats as shown in the drawing. Slide the shelf in place and then screw and glue the support cleats in place. Screw the shelf to cleats from below. After it's secured, glue and nail the $\frac{3}{4}$ x 1-in. maple edging.

Apply maple edging to the bottom shelf and trim it flush where the shelf will connect with the legs. After both shelves are in place, plug all holes, sand

flush and use a $\frac{3}{8}$ -in.-rad. rounding-over bit to rout outer leg corners.

Next, cut the two electrical-box mounting brackets. Fasten the brackets and switch boxes and mount the outlet boxes inside the apron. Secure the octagonal box and bring to it the 12/3 type J wire for the power supply. Split the circuit into two lines sending each through one switch and outlet to complete the wiring.

Cut the tabletop base to size, lay out centerlines and mark the back for the

two octagonal cutouts. Bore a 1-in.-dia. hole at the corners of each octagon and use a sabre saw to complete the cutouts. Our circular saw required rabbets cut into the underside of the base to permit tilting of the blade.

(See note on drawing.)

Prepare the inner guides and plates by setting your saw to 30° and ripping one inner guide to width. Then rip the stock for the sliding and fixed plates (see photo No. 10) and mark a centerline. Set the saw to 90° and rip the other

MATERIALS LIST—POWER-TOOL TABLE

Key	No.	Size and description (use)
A	4	$\frac{3}{4}$ x $1\frac{1}{2}$ x 22 1/2" birch plywood (outer guide)
B	4	$\frac{3}{4}$ x $3\frac{1}{2}$ x 22 1/2" birch plywood (inner guide)
C	2	$\frac{3}{4}$ x 6 1/2 x 14 1/2" birch plywood (fixed plate)
D	2	$\frac{3}{4}$ x 12 1/2 x 14 1/2" birch plywood* (sliding plate)
E	2	$\frac{3}{4}$ x 13 x 13" birch plywood (mounting plate)
F	1	$\frac{3}{4}$ x 25 1/2 x 47 1/2" birch plywood (base)
G	2	$\frac{3}{4}$ x $1\frac{1}{2}$ x 48" maple (edge band)
H	2	$\frac{3}{4}$ x $1\frac{1}{2}$ x 25 1/2" maple (edge band)
I	2	$\frac{3}{4}$ x $\frac{3}{4}$ x 14 1/2" maple (edge band)
J	2	$\frac{3}{4}$ x $\frac{3}{4}$ x 1 1/2" maple (insert)
K	3	$\frac{1}{2}$ x 2 x 8 1/2" hardboard/plywood (saw plate insert)
L	2	$\frac{1}{2}$ x 4 x 43" maple (long apron)
M	3	$\frac{1}{2}$ x 4 x 22 1/2" maple (short apron/partition)
N	8	$\frac{1}{2}$ x 2 1/2 x 19 1/2" maple (leg)
O	8	$\frac{1}{2}$ x 4 x 19 1/2" maple (leg)

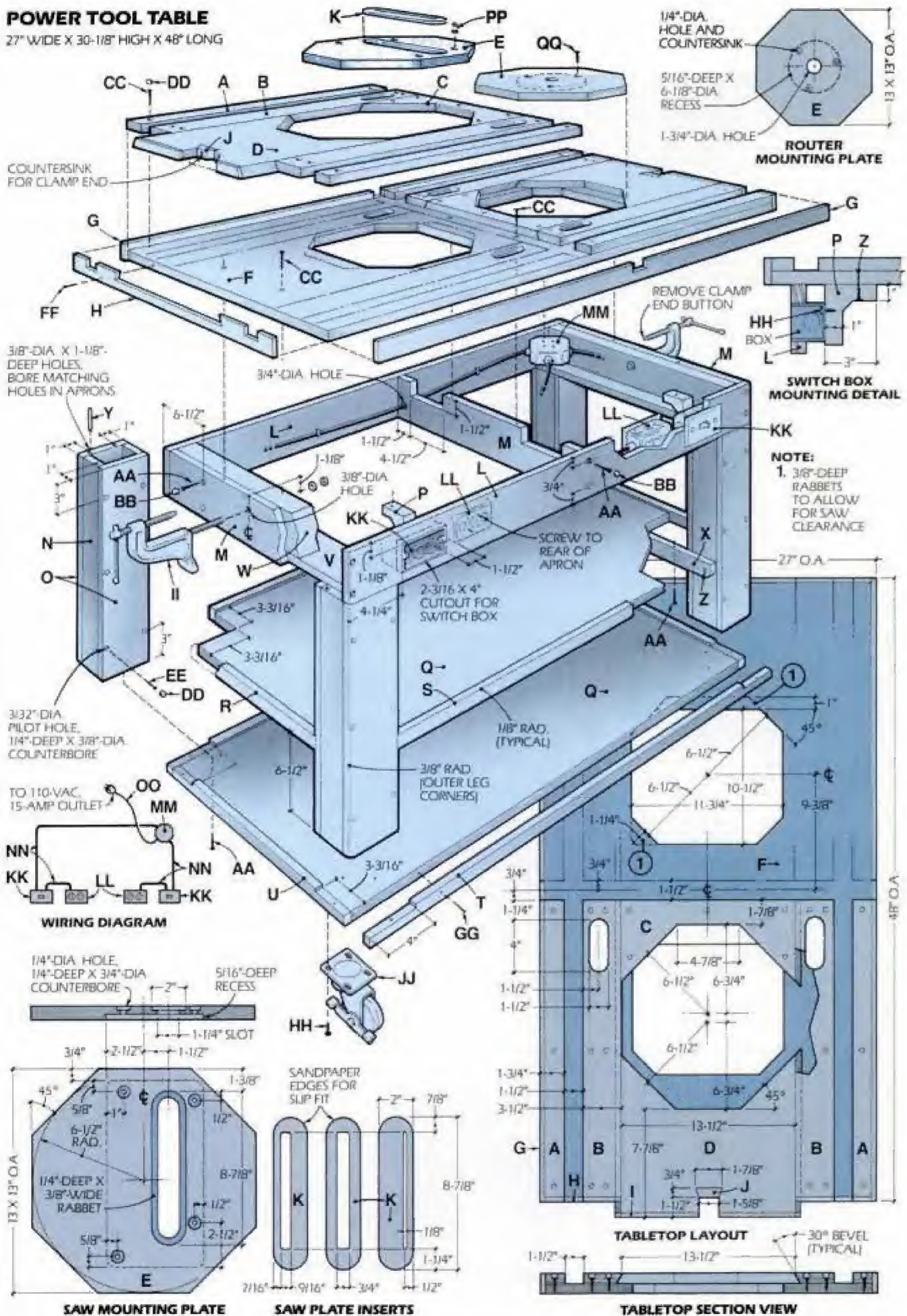
P	2	$\frac{1}{2}$ x 3 x $3\frac{1}{2}$ " maple (box mounting bracket)
Q	2	$\frac{3}{4}$ x 22 1/2 x 41 1/2" birch plywood (shelf)
R	2	$\frac{1}{2}$ x 1 x 16" maple (edge band)
S	2	$\frac{1}{2}$ x 1 x 35" maple (edge band)
T	2	$\frac{1}{2}$ x 1 x 43" maple (edge band)
U	2	$\frac{1}{2}$ x 1 x 22 1/2" maple (edge band)
V	2	$\frac{1}{2}$ x $3\frac{1}{2}$ x 22 1/2" maple (ledger)
W	2	$1\frac{1}{2}$ x $3\frac{1}{2}$ x 22 1/2" spruce/fir (blocking)
X	2	$\frac{1}{2}$ x $1\frac{1}{2}$ x 22" maple (cleat)
Y	12	$\frac{3}{8}$ -dia. x 2" dowel
Z	6	$1\frac{1}{2}$ " No. 10 fh screw
AA		2" No. 12 fh screw
BB		$\frac{1}{2}$ -dia. plug
CC		$1\frac{1}{2}$ " No. 8 fh screw
DD		$\frac{3}{8}$ -dia. plug
EE		4d common nail
FF		2d finishing nail
GG		4d finishing nail
HH		$\frac{3}{8}$ " self-tapping screw
II*	2	Holddown clamp (Jorgensen)
JJ**	4	Braking caster
KK	2	Surface-mount electrical box

	2	ON/OFF switch
	2	Switch cover plate
	4	Cable connectors
		Wire nuts
MM	1	Octagonal junction box
	1	Cover plate
	3	Cable connectors
		Wire nuts
LL	2	Surface-mount electrical box
	2	Duplex outlets with ground
	2	Duplex cover plate
NN		No. 12/2 plastic sheathed cable with ground (Romex)
OO	36"	No. 12/3 type J wire and plug with ground
PP	4	$\frac{1}{4}$ -20 x 1" cap screw, flat washer, hexnut
QQ	3	1" 12-24 fh machine screw

Misc: *Clamp (No. 13F14.01) available from Garrett Wade, 161 Avenue of the Americas, New York, NY 10013 (\$12 postpaid). **Set of four casters (No. 76003) available from Armor Products, Box 445, E. Northport, NY 11731 (\$72 postpaid).

POWER TOOL TABLE

27" WIDE X 30-1/8" HIGH X 48" LONG



Don't Blame Your Age For Poor Hearing.

Chicago, Ill.—A free offer of special interest to those who hear but do not understand words has been announced by Beltone. A non-operating model of the smallest Beltone aid of its kind will be given absolutely free to anyone who sends for this free model now.

Send for this model, it will show you how tiny hearing help can be. It is not a real hearing aid and it's yours to keep free. The actual aid weighs less than an eighth of an ounce, and it fits completely into the ear canal.

These models are free, so we suggest you write for yours now. Again, we repeat, there is no cost, and certainly no obligation. All hearing problems are not alike and some cannot be helped by a hearing aid but many can. So, send for your free model now. Thousands have already been mailed. So be sure to send your name, address, and phone number today to Department 4963, Beltone Electronics, 4201 West Victoria Street, Chicago, Illinois 60646.

Offer not valid in California.

SHOPWORK *Guide*

One For All

inner guide. Be careful to make these cuts straight and parallel. Then cross-cut the guides to length.

Lay out the fixed and sliding plates and cut with a sabre saw. Then, using a 1½-in. spacer between them, center the two fixed plates on the base to be square to the base centerline and screw in place. Next, temporarily clamp the two sliding plates in position so that their centerlines, and those of the fixed plates, are all on the same line. Lay the inner guides on both sides of the plates and clamp. Check that the long edges of the inner guides are square with the gap between the fixed plates and the sliding plates move freely, but are not

too loose. Then screw guides in place.

Four slotted holes are cut in the inner guides to facilitate clamping the fence in position. Cut each hole by first boring two 1½-in.-dia. holes and then cutting away the waste with a sabre saw. Screw the base to the aprons. Then, use 1½-in. spacers in the long track and cross track to position the outer guides.

To cut the mounting plates, lay out a 13 × 13-in. square. Draw the diagonals and inscribe a circle. Where the circle intersects the diagonals draw a 45° line. Saw-mounting plate must be recessed to accept the base of your circular saw. Because each brand of saw is slightly different, you must adapt our dimensions to your saw. Drill holes for the mounting bolts in the saw base and corresponding ¼-in. holes and ⅝-in. counterbores in the mounting plate.



1 Assemble the legs with nails and glue. Bore ⅝-in. pilot holes and counterbore for plugs. Finish driving with a drift punch.



2 Screw the aprons together to make the frame. Cut two 1½ × 4½-in. notches in the partition for fence-clamp access.



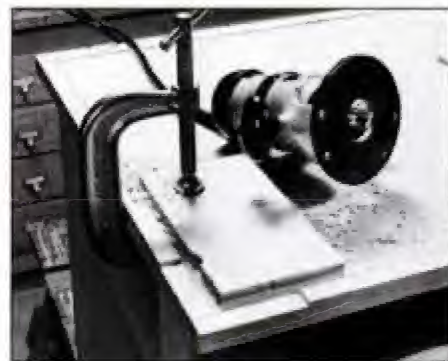
3 Use dowel centers to transfer hole locations from the legs to the frame. Clamp two blocks at the corners to align the legs.



4 A drill guide ensures straight dowel holes. Bore 1½-in.-deep holes for 2-in. dowels to allow for excess glue.



5 Slide in the top shelf before attaching the support cleats. Screw and glue the cleats and screw the shelf in from below.



6 Trim the maple edge band flush on the lower shelf where the legs join. Screw the shelf in place with 2-in. No. 12 fh screws.

WOODWORKER'S CATALOG

There are over 3,000 money saving reasons why woodworkers rely on Constantine.



3,000 woodwork items—to help you Build-Restore-Repair-Refinish! Over 200 different woods... 150 veneers... 500 plans... cabinet hardware... 96 How-To Books... 118 carving tools and chisels... 76 inlay designs... and lots more for One-Stop, Right-Price Shopping without leaving home!

116 Page Catalog—Only \$1.00

CONSTANTINE Est. 1812

2051L Eastchester Road, Bronx, NY 10461

BUILD YOUR OWN ROCKET MOTORS!

- * 40 POUNDS THRUST!
- * FIFTY CENTS EACH!
- * BUILD A DOZEN IN AN EVENING!

Write for our catalog, and we'll send you a WORKING SAMPLE of an electric igniter that YOU CAN MAKE YOURSELF from materials you'll find around the house.

Send \$2.00 to:
Dept. PM7 THE TELEFLITE CORPORATION,
11620 Kitching St., Sunnymead, Calif. 92388

FAMOUS NATIONALLY ADVERTISED SENTRY 55XK RADAR DETECTOR

FOR ONLY \$29⁹⁵? IF YOU GIVE US YOUR
OPINION ON THE
NATIONAL 55 MPH
SPEED LIMIT

Unbelievable But True!

As part of an enormous nation-wide publicity campaign, USA Buyers Network will "give away" one million of its most expensive radar detectors — the famous **"SENTRY" 55XK™** — for the unprecedented low publicity price of only \$29.95 each — only to the first one million (1,000,000) readers who write to the company address (below) before Midnight July 30, 1987.



detecting technology. Housed in a sleek, protective black steel casing are sophisticated electric sensors that pickup — and alert a driver to — the presence of operating police radar. Its controls are simple — just turn it on... and wait for near by police radar to trigger the

DETECTOR's *two* immediate warnings — both a red signal light and audio tone. And because it monitors microwave frequency (the most commonly used radar frequency), the **"SENTRY" 55XK™ RADAR DETECTOR** is very discriminating against "false alarms" or unwanted interference.

Each RADAR DETECTOR comes complete with power indicator light, a built-in 7½ foot power cord adapter (to plug into your vehicle's cigarette lighter), plus easy-to-install mounting hardware and instructions. As with every item offered by this major publicity firm, the **"SENTRY" 55XK™ RADAR DETECTOR** is covered by the company's money-back guarantee and has a full 2-year consumer warranty. There is a limit of (2) units per address at this low price, but if your request is mailed early enough (before July 25), you may request up to five units. These famous **"SENTRY" 55XK™ RADAR DETECTORS** will not be sold at this low price by the company in any retail or department store.

To order, mail your name and address and only \$29.95 for each unit you are requesting. Add just \$4.00 for priority one shipping, handling and insurance no matter how many units you are requesting. MC & Visa users please supply Account No., Expiration Date and Signature. (State sales tax included in price). Allow up to 60 days for shipment. Mail to:

National Speed Limit Survey

- ☐ YES! I'M IN FAVOR OF RAISING THE 55-MPH LIMIT!
☐ NO! I THINK THE 55-MPH LIMIT IS FINE!

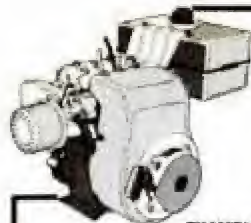
These are the same technologically advanced, widely popular **RADAR DETECTORS** that have been "showcased" in leading magazines and newspapers across America! Designed for use on dashboard or visor, they are suitable for any motor vehicle — cars, vans or trucks. They are the most expensive, top-of-the-line **RADAR DETECTORS** ever offered by this multi-million dollar shopping club. Yet they are now being made available — in conjunction with this special "publicity" campaign — at just a fraction of the selling price you'd expect to see by others!

PICKS UP POLICE RADAR INSTANTLY!

The **"SENTRY" 55XK™ RADAR DETECTOR** represents the latest breakthrough in compact radar-

USA Buyers Network, Dept. RD1031, One American Way,
Roanoke, VA 24016-8032

© 1987, USA Buyers Network



GASOLINE ENGINES

Generators, Troy-Built Tillers, and more

**FREE CATALOG
DISCOUNT PRICES**

EXAMPLES

5HP Briggs Horizontal	\$143.95
8HP Tecumseh Horizontal	\$199.95
3 1/2HP Tecumseh Vertical	\$99.95
10HP Tecumseh Vertical Elect.	\$239.95
500 Watt Toro Generator	\$239.95

2 to 18 HP Engines, 500 to 5000 watt
Generators, all at Discount Prices

SMALL ENGINE CITY

2612 Lyndale So. Dept. PM7
Minneapolis, MN 55408, 612-872-4288
1-800-645-4488

CABLE TV EQUIPMENT

***** PRESENTING *****
***** STARRING *****
JERROLD, HAMLIN, OAK
AND OTHER FAMOUS MANUFACTURERS

- FINEST WARRANTY PROGRAM AVAILABLE
- LOWEST RETAIL/WHOLESALE PRICES IN U.S.
- ORDERS SHIPPED FROM STOCK WITHIN 24 HOURS

FOR FREE CATALOG ONLY 1-800-345-8927
FOR ALL INFORMATION 1-818-716-5914

PACIFIC CABLE CO., INC.

7325V REMUDA BLVD., DEPT. 1708
REMSDA, CA 91355

A SINGER'S DREAM!



REMOVES VOCALS FROM RECORDS!

Now You can sing with the world's best bands!
The Thompson Vocal Eliminator can remove
most or virtually all of a lead vocal from a standard
stereo record and leave the background!

Write or call for a free brochure and demo record.

LT Sound, Dept. P.M., P.O. Box 338,
Stone Mountain, GA 30086 (404) 493-1258

What Is He Doing?

He's making a concrete flower
pot... and so can YOU!

Make and sell your own
ornamental concrete items.
Order your book with over
425 aluminum molds, prices
and production trade secrets
from world's largest mold
manufacturer.



Only \$700

CONCRETE MACHINERY CO., INC.

P.O. Box A-99 Hickory, NC 28603

GO KARTS, ENGINES-KITS-PARTS

72 PAGE CATALOG
\$3.00 REFUNDABLE
Largest Selection.



(216) 357-5569
KW KART WORLD Dept. M
1488 Mentor Ave., Painesville, Ohio 44077

DISCOUNT
PRICES

One For All

You'll need to make a few throat plates to accommodate the most commonly used blade angles. Use 1/4-in. hardboard for these inserts and recess the mounting plates to accept them. The router plate also should be recessed. Although we routed a circular recess, a square one will work just as well. Make sure that the router is centered in the mounting plate.

Cut the miter-gauge parts to the dimensions given. The miter guide rail must be trimmed to 1/4 in. in thickness so it lies flush with the table surface when in use. Assemble the slotted adjustable beam by laminating three layers as shown in the drawing. Cut the carriage bolt head recess by drilling successive blind holes with a 1-in. bit. Clean away the excess with a sharp

chisel. Then rout the slot in the guide rail with a 3/4-in. straight bit. Take care to position the guide rail at 90° to the plate and clamp it in place before drilling the pilot holes.

The bridge fence is designed to be used in a closed position—when the tools are mounted in the table—or open position which allows stock to be passed underneath and a tool to be hand operated from above. When assembling the fence, first place the two guide rails—complete with sides and braces attached—in the tracks of the table. Then place a straight piece of stock in the cross track of the table and align the fence guide rails against this. Next, secure the fence top with 1 1/2-in. No. 10 fh screws. Position the pivoting fence sections and insert the end pins. The pivoting fence is held in the upright position by two roller catches. When



7 The cutouts in the base are started with 1-in.-dia. holes bored at the corners. Use a guide to make the cuts.



10 Bore pilot holes and counterbores for the guide mounting screws and plugs. Align outer guides with a 1 1/2-in. spacer.



8 Rip the inner guides and the fixed and sliding plates. Be sure that the cuts are absolutely straight and parallel.



11 Cut the clamp access holes in the inner guides by first boring 1 1/2-in. holes and cutting the waste with a sabre saw.



9 Install the fixed plates on, and square with, the centerline. Place sliding plates on centerline and install inner guides.



12 Mount the switch and outlet boxes on the long apron. An octagon junction box splits the circuit to the two tools.



Get in on the PROFITS in SMALL ENGINE service and repair Start your own money

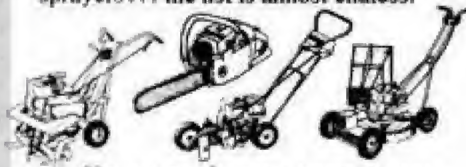
In just a short time, you can be ready to join one of the fastest growing industries in America... an industry where qualified men are making from \$25.00 to \$30.00 per hour... and that's just for labor. Parts, engines and accessories add even more to the profits.



Because the small engine industry has grown so quickly, an acute shortage of qualified Small Engine Professionals exists throughout the country. In fact, it's not unusual for a good small engine man to be three to four weeks behind in the summer and at least a week behind in the winter. When you see how many small engines are in use today, it's easy to understand why qualified men command such high prices — as much as \$49.95 for a simple tune-up that takes less than an hour!

65-million small engines are in service today!

That's right — there are over sixty-five million 2-cycle and 4-cycle small engines in service across the U.S.A. That's the official count from the Engine Service Assn., and new engines are being built at a rate of one-million per month! With fully accredited and approved Foley-Belsaw training, you can soon have the skill and knowledge to make top money servicing these engines. Home-owners and businessmen will seek you out and pay you well to service and repair their lawnmowers, tillers, edgers, power rakes, garden tractors, chain saws, mini-bikes, go-carts, snowmobiles, generators, snowblowers, paint sprayers... the list is almost endless.



No experience necessary.

You don't need to be a 'born mechanic' or have prior experience. If you can read, you can master this profitable trade right at home, in your sparetime, without missing a single paycheck. Lessons are fully illustrated — so clear you can't go wrong.



BEAT INFLATION!

Cash in on the huge demand for small engine repair.

Work part time, full time right at home - we help you every step of the way.

making business!

You receive trade secrets and business plans.

We guide you every step of the way, including tested and proven instructions on how to get business, what to charge, how to get free advertising, where to get supplies wholesale... all the "tricks of the trade"... all the inside facts you need to assure success right from the start.

Increased Income

"I've had about 8 years experience repairing small engines... but repairs were only minor... until I started the Foley-Belsaw Course."



Walter H. Strick Campbell, California

With our famous 'learn-by-doing' training method, you get practical 'hands-on' experience with specialized tools and equipment that you'll receive with your training plus a brand-new 4 HP engine — all yours to keep!

SEND FOR FREE FACTS!

You risk nothing by accepting this offer to find out how Foley-Belsaw training can give you the skills you need to increase your income in a high-profit, recession-proof business of your own.

Just fill in and mail coupon below (or send postcard) to receive full information and details by return mail. **DO IT TODAY!**

You get all this Professional equipment with your course, PLUS 4 H.P. Engine.... ALL YOURS TO KEEP.... All at NO EXTRA COST.



Send TODAY for this fact-filled **FREE BOOKLET!**



Tells how you quickly train to be your own boss in a profitable Sparetime or Fulltime business of your own PLUS complete details on our 30-Day NO RISK Trial Offer!



FOLEY-BELSAW INSTITUTE
6301 Equitable Rd., Dept. 51207
Kansas City, Mo. 64120

There is NO OBLIGATION and NO SALESMAN Will Call—ever!

FOLEY-BELSAW INSTITUTE
6301 Equitable Rd., Dept. 51207
Kansas City, Mo. 64120

☐ YES, please send me the FREE booklet that gives full details about starting my own business in Small Engine Repair. I understand there is no obligation and that no salesman will call.

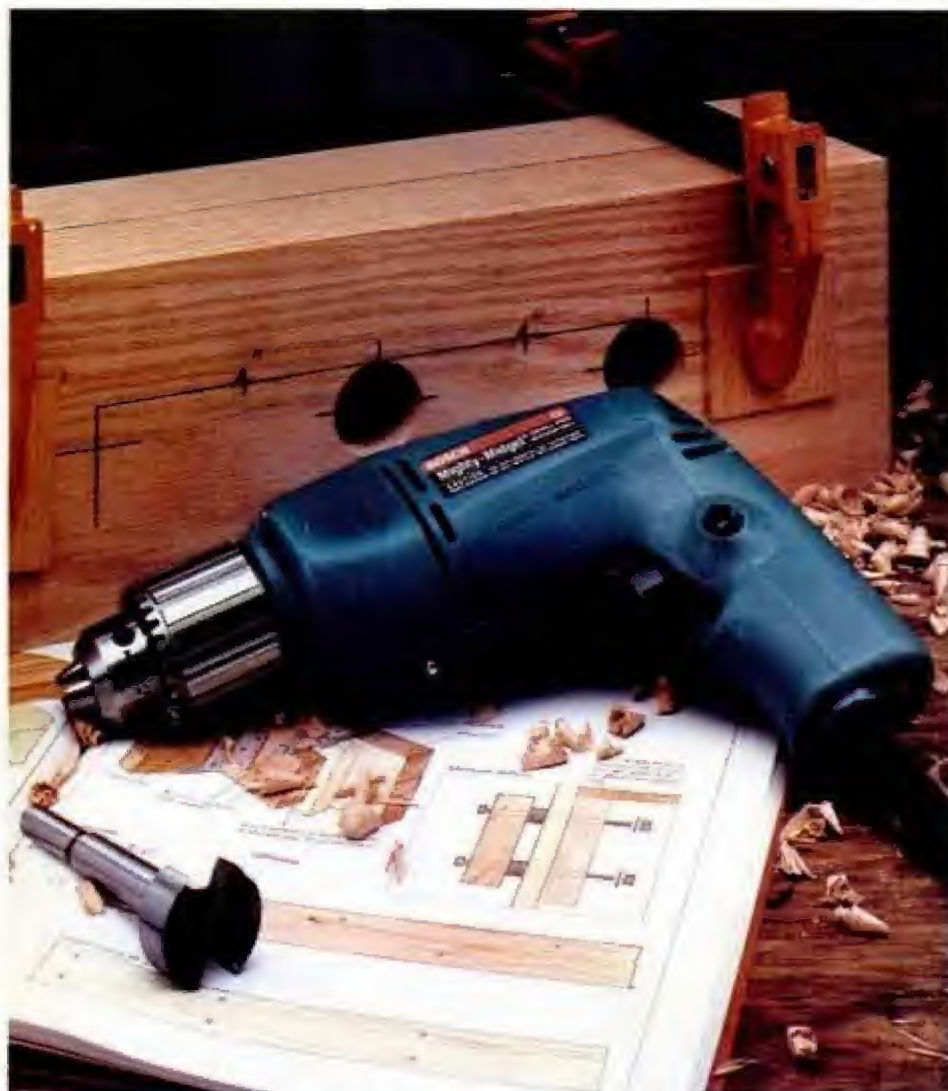
Name

Address

City

State Zip





Take Our High-Performance Compact For A Spin.

It gives you everything a high-performance compact should: abundant power, smooth handling, superior maneuverability—you can even shift into reverse. And it's almost impossible to stall.

A Bosch Mighty-Midget® variable speed reversing drill is the one tool you need to take on every drilling job around your home.

Its unique permanent magnet motor puts out far more hole-drilling torque than the wound field coils of regular drills. More torque not only makes drilling easier for you, it requires less gearing-down. So all that power can come in a compact, light-weight, easy-to-handle package. And heavy-duty armature windings let you push your Mighty-Midget drill hard—without the worry of burning it out.

Of course, a $\frac{3}{8}$ " or $\frac{1}{2}$ " Mighty-Midget drill will do a lot more than drill holes for you. Add Bosch accessories to grind, sand, drive screws, strip paint, even wire-brush rust.

Get professional quality performance and the value of a Mighty-Midget drill, from Bosch. Ask for them where pro tools are sold—see the Yellow Pages under "Tools—Electric" for your nearest Bosch Power Tool Distributor. He can let you test-drive other Bosch Tools, too: sanders, routers, saws and lots more to complete your power tool line-up.



BOSCH

"Quality You Can Hold On To."

©1987 Robert Bosch Power Tool Corporation

One For All

installing these, check to be sure that the fence is square with the tabletop.

Two hold-down clamps are used to tighten the sliding plates on the mounting plates. Remove the button ends of the clamps by holding the buttons in a vise while backing off the screws. Bore clamp mounting holes through the short aprons and blocking. Countersink the maple inserts on the sliding plates to receive the ball ends and install clamps.

Trim the power table edges $\frac{3}{16}$ -in.-thick maple and apply three coats of urethane varnish, thinning the first for good penetration. Apply a first coat only to the insides of the tracks to seal the wood and permit easy sliding. **PM**



13 Rout a $\frac{5}{16}$ -in. recess in the saw-mounting plate to accept the circular saw base. Tailor the size and position to your saw.

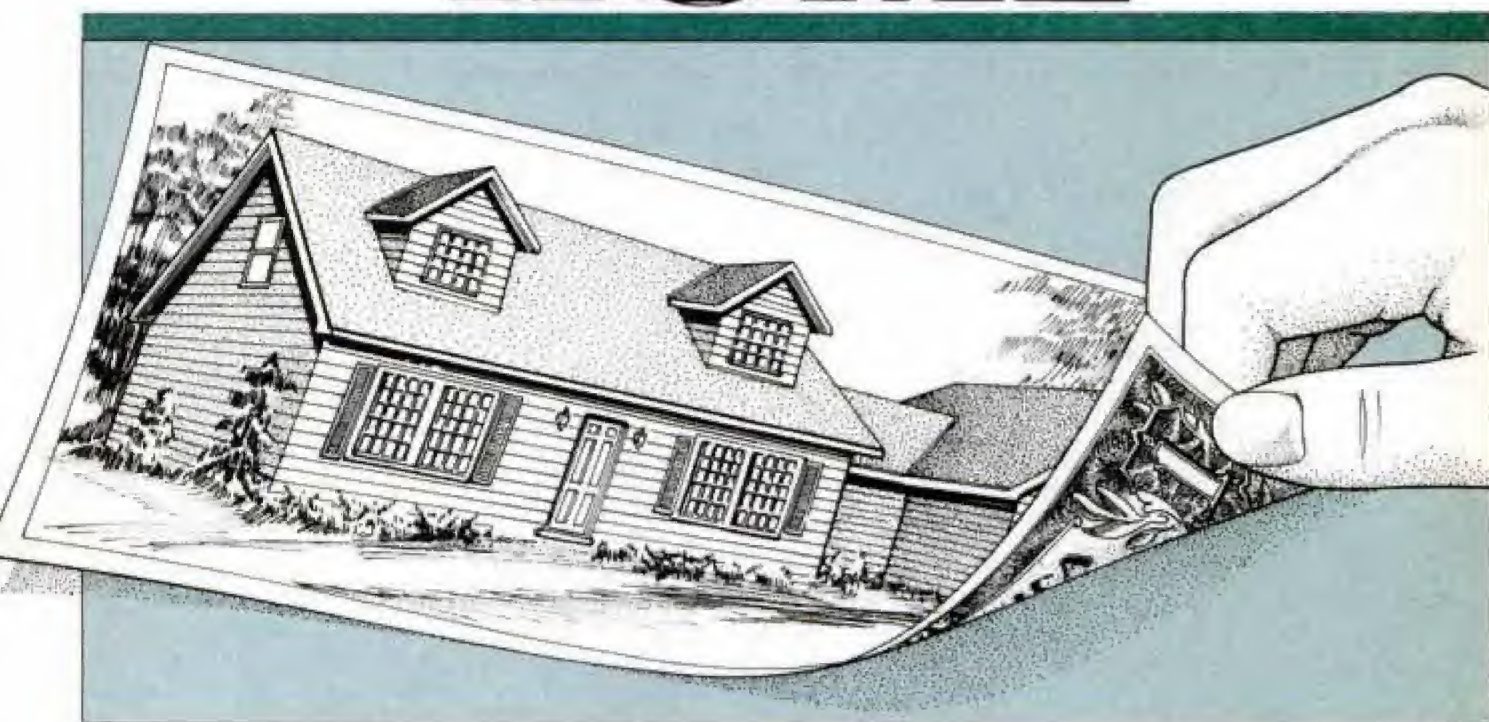


14 The miter-gauge rail is recessed underneath for the carriage bolt head. Laminate maple stock for the adjustable beam.



15 Assemble the fence with the rails in the tracks. Use a piece of straight stock in the cross track to insure square.

THE BETTER HOME



The Pros And Cons Of HOME EQUITY LOANS

It's virtually impossible these days to escape lenders' sales pitches for a new type of second mortgage, the home equity line of credit. Switch on the radio and you're assaulted by annoying jingles—"Call 800-USA-Loan, call 800-USA-Loan." Full-page newspaper ads tout tantalizingly low loan rates. Many lenders have also begun exhorting potential borrowers through the mail. The Loan Depot, a mortgage broker that arranges home equity lines nationwide, plans to send out 15,000 letters a day to entice homeowners to borrow against their homes. And just in case the advertising blitz isn't enough to woo you into the bank, some lenders have used a tactic formerly reserved for getting you to put money into the bank: giving away cameras, pocket TVs, coffeemakers and any number of other gadgets to borrow-

BY WALTER UPDEGRAVE
Illustrations by George Retseck

ers who will sign up for a home equity loan.

So far, this mass merchandising effort has been wildly successful—at least from the lenders' point of view. Borrowings under home equity lines have zoomed from less than \$1 billion in 1980 to \$35 billion in 1986. And with everyone from banks to credit unions to finance companies to major brokerage firms like Merrill Lynch hawking these loans, market research firm SMR Corp. predicts borrowings against home equity lines will more than double again, topping \$75 billion in loans outstanding, by the end of this year.

Why now?

Why the sudden craze for this new form of credit? "Home equity lines are one of the most flexible and low-cost methods of borrowing available to consumers," says Charles Humm, vice president of brokerage firm Merrill Lynch, which makes home equity loans in 38 states. "It's a hassle-free way to borrow." Once you've qualified for a line of credit, there's no need to go down to the bank every time you want to draw against the loan. Instead, you borrow by simply writing a check against a special account set up by the lender. About 100 banks across the country even allow you to use your credit card to draw against a home equity line. In short, all participating lenders are making it as easy as possible for you to get at the money.

The new tax bill has also boosted the

popularity of these loans. A treasured tax loophole—deductibility of interest on such consumer borrowings as credit cards and car loans—is being phased out by tax reform. This year, you can only deduct 65 percent of the interest on such borrowings.

Next year, that percentage drops to 40 percent, then falls to 20 percent in 1989, 10 percent in 1990, and disappears completely in 1991. But borrowings under a home equity line remain deductible, within limits.

If the proceeds of your loan are used for medical or educational purposes, the interest is fully tax deductible. Otherwise, deductions are limited to interest on borrowings up to the original purchase price of the house plus the cost of all the improvements you've made.

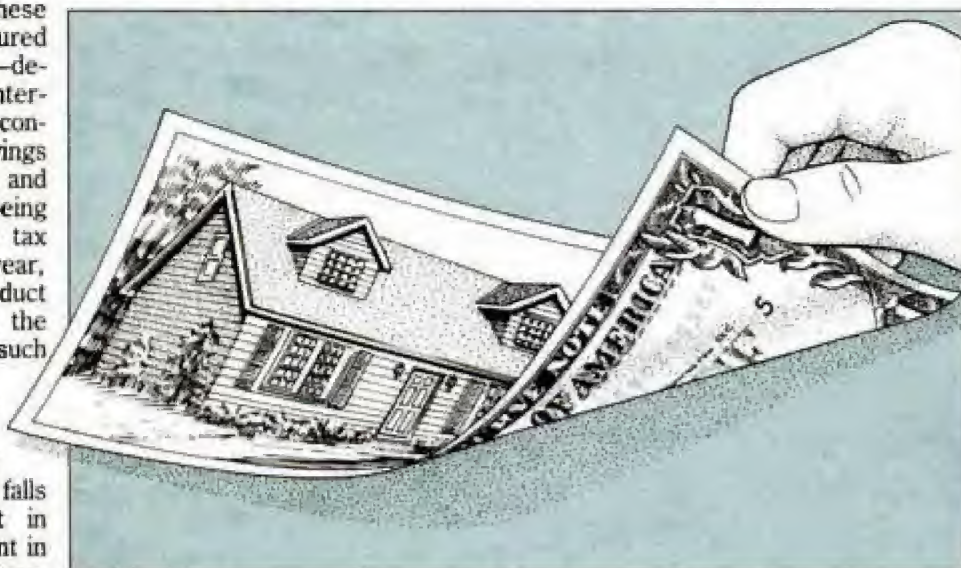
How they work

But before you join the parade of homeowners who've already signed up for home equity lines of credit, you should understand how these loans work and weigh their advantages against some possible pitfalls.

The flip side to the convenience of these loans is overindulgence: You may be tempted to borrow more than you actually need. The average line of credit on home equity loans is about \$40,000—giving reckless borrowers far more leeway to wreak financial havoc on themselves than with credit cards which generally have \$3000 to \$5000 limits. Also, most home equity lines carry variable rates. If the general level of interest rates rises, so will the monthly payment on your home equity loan.

But the most frightening aspect of these loans is one that the lender is least likely to dwell on. "What people may not realize but should know when they take out an equity loan, is that they are putting their house in jeopardy," says Donald Badders, president of the National Foundation for Consumer Credit. "If you default on the loan, you lose your home."

To drum up loan volume, many lenders tout home equity lines as an all-



purpose form of consumer borrowing—an easy way to buy a new car, finance a vacation or even a way to pay down your credit card balances.

But, given the high stakes involved, most financial planners and credit experts suggest these lines of credit be reserved for such necessities as medical or educational expenses or for home improvements that significantly add to the resale value of your home. "It's very easy for the equity in your home which might have taken years to build up to be quickly chiseled away by borrowing for vacations or other frivolous or casual expenses," says John Pollock, president of New World Decisions, a market research firm that tracks consumers' use of debt.

Terms

The terms of a home equity line will vary somewhat from lender to lender, but most work on the same principle: The lender extends you a line of credit that allows you to draw on the equity in your house. Generally, the lender lets you borrow up to 80 percent of the un-mortgaged value of your house. If your home's market value is \$150,000 and your mortgage balance is \$50,000, you might qualify for an \$80,000 line of credit. You can draw down the entire amount of the line or just a portion.

Most home equity lines are set up as revolving lines of credit much the same as credit cards, so you can continue to borrow against the line as you repay principal. Lenders also examine your credit history and gauge your ability to repay borrowings based on your income. Thus, even though you have enough equity in your house to merit a

\$50,000 line of credit, the bank might grant you a smaller one—or none at all—if you've got a lousy credit record or your income simply isn't big enough to handle payments on a \$50,000 loan. The way individual lenders judge your credit worthiness varies widely. Some aggressive lenders may have more flexible standards.

Since your home serves as collateral for these loans,

lenders consider them less risky and, therefore, charge a lower rate than for other types of loans. Although a few lenders may offer fixed-rate home equity lines, the interest rate on these loans is usually pegged one to two percentage points over an index such as the prime lending rate, the rate banks charge to their best business customers.

With prime at 7.5 percent, as it was at the beginning of this year, the going rate for most home equity loans runs between 8.5 percent and 9.5 percent. Keep in mind, though, that with a variable rate loan, you run the risk that the interest rate—and your monthly payment—can rise.

"If inflation takes off," says Lewis Alttest, a New York City financial planner, "people may find themselves at double-digit interest rates and in financial difficulty." For example, for a \$50,000 loan at 9 percent with a 15-year repayment schedule (two percentage points above prime) monthly payments are \$522. But if prime rises two percentage points, the rate on the loan goes to 11.5 percent and the monthly payment increases to \$585. Were prime to move upward yet another two percentage points, the loan rate would jump to 13.5 percent and the monthly payment climb to \$650—\$128 a month more than the initial payment negotiated during a period of low inflation.

The interest rate isn't the only cost for these loans. Most lenders also impose an origination fee, sometimes called points, equal to 1 percent to 2 percent of the amount of the line. Thus, if you sign up for a \$50,000 line of credit, you pay a \$500 to \$1000 fee, regardless of how much you borrow against that

line. "Sometimes the lower rate of a home equity line can be eaten up by these costs," says Altfest.

Since a home equity line is another mortgage on your house, you may also have to pay some of the same closing costs you paid when you bought your home. Fees for a new appraisal, title search, title insurance and attorneys' services can add another \$400 to \$700 to the cost of the loan, although some lenders include these costs in the origination fee.

Generally, as long as you plan to have the loan outstanding more than a few years, the lower rate will more than compensate for the upfront origination fees and closing costs. In their zeal to make these loans, many lenders are waiving closing costs and origination fees. This is a good deal for borrowers, provided the loan's interest rate is still competitive.

Repayment

Repayment terms vary widely. Some banks spread principal and interest payments on borrowings over 10 years, while others give you 15 or as many as 25 years to repay. Other lenders allow you to make interest payments only, if you wish. In that case, the full amount of the loan is due when its term expires.

While this arrangement—known as a balloon loan—lowers your monthly payments, it leaves you with the problem of coming up with a huge payment at the end of the loan something that is often impossible. "Balloon loans have gotten a lot of people in trouble," says Badders. "No matter how much people try to plan for it, that day comes around when the balance is due and people just aren't ready for it."

Badders and Altfest both suggest that, even if the lender doesn't require regular principal payments, you should insist on setting up a repayment schedule and stick to it. This will prevent you from being pinned down by a huge load of debt that could easily crush you if interest rates rise. Under these circumstances, even some relatively modest

additional expenses, for instance a medical emergency or the sudden need for a new car, could result in losing your home.

Shop around

Since the terms and rates can vary so widely, it's important to shop around before taking out a home equity line. For example, while Society for Savings, a Hartford, Connecticut, savings bank, recently charged 8.5 percent (prime plus 1 percent) for its home equity line, brokerage firm Merrill Lynch got 9.5 percent (prime plus 2 percent), and Beneficial Corp., a consumer finance company that makes home equity lines nationwide, hit up borrowers for prime plus 4 percent—an 11.5 percent interest rate. For a \$30,000 loan, paying 11.5 percent instead of 8.5 percent could cost you an extra \$900 a year. With premiums like this involved, doing some careful research could pay off handsomely in interest savings.

Beware, though, of teaser rates. Some lenders push home equity lines that have introductory rates as low as 5 percent. But the bargain-basement rate lasts only a year—sometimes less—and then goes up. "Don't just look at the rate for the first year," says Altfest. "You want to choose a line that has a competitive rate over its entire term."

You can also save on borrowing costs by comparing origination fees and closing costs. These elements are generally considered to be the "fine print" in these loans. A 2 percent origination fee on a \$60,000 line costs you \$1200. You can cut that in half by finding a lender who charges 1 percent and eliminate it entirely if you go to a bank that's waiving

the fee to lure new customers.

Verifiable index

Make sure the lender is using an independent, verifiable index for pricing the loan. Most lenders tie their rate to the prime rate which is published in most daily newspapers. A quick check can tell you what your rate should be. A few banks, however, peg the rates on their loans to their own cost of funds, a

measure that at best is difficult to verify and at worst subject to manipulation by the bank. You're usually better off going with a lender who uses an independent, easy-to-follow index such as the prime rate.

Get what you need

Just because your banker or broker is willing to give you a fat line of credit, say \$90,000, that doesn't mean you should necessarily apply for the maximum. Instead, you should realistically gauge the amount of credit you need, add a bit of a cushion for an emergency, and take out a line for that amount.

The reason is that you'll pay an origination fee of up to 2 percent on the entire amount of the line you are granted whether you actually borrow against it or not. So if you take a \$90,000 line but the most you ever draw on it is \$20,000, you've paid an origination fee of \$1800 for a \$20,000 loan—effectively a 9 percent fee. Better to plan carefully and take a \$20,000 to \$30,000 line and pay a \$400 to \$600 fee.

The bottom line

Used properly, home equity lines provide you with a flexible, efficient and relatively inexpensive method of financing a variety of needs. But before you write a check against your house, do some aggressive comparison shopping and remind yourself again of the inherent risks in going this route. "It's wise to exercise a little extra caution and discipline with these loans," says Ross Levin, a Minneapolis financial planner. "After all, the collateral you're putting up is the most important asset you own—your home."

PM

How To Install A DEADBOLT LOCK

It seems that all of us are more security conscious than we used to be. New high-end electronic security systems seem to be springing up everywhere these days. And while many of these boast truly remarkable capabilities, it's important to remember that any good security system should start out with the installation of deadbolt locks on all your exterior doors. With a little care and the right tools you can install them yourself and save a substantial amount of money in the process.

Deadbolts come in two basic styles. One requires a key to lock and unlock the door from both sides. The other requires a key on the outside, but is easily operated with a turn unit knob from the inside. The type you choose will depend on the type of doors you have and on fire-safety factors.

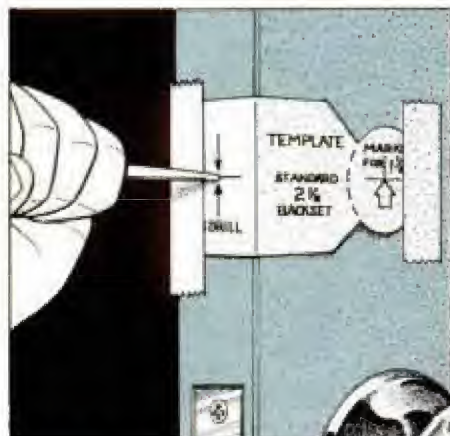
If you have a door with a glass panel in it, then an inside key lock offers more protection from an intruder who might be able to reach the turn units by breaking the glass. If your doors have no glass, then locks with inside turn units will work fine. The added advantage of a lock that has a turn unit on the inside is that you don't need a key to get out in the event of a fire.

The choice is yours. The installation is virtually the same.

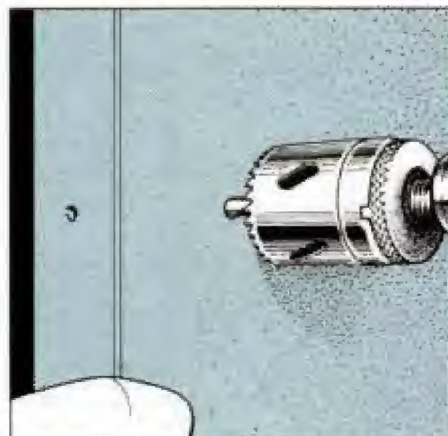
Start by deciding where you want the lock to be. If you have a hollow-core



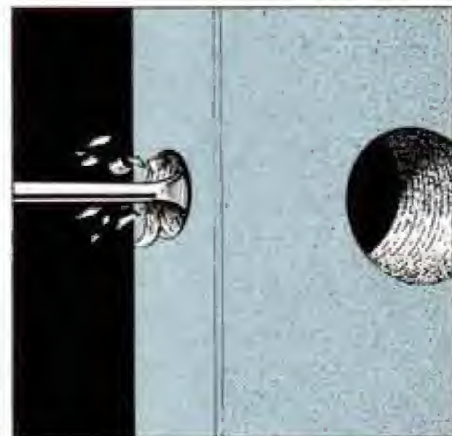
Installing deadbolt locks on your exterior doors is the first step in improving the security of your home. The job requires just a few tools and a couple of hours.



1 Begin by positioning the template supplied with your lock on the edge of your door. Use an awl to mark hole locations.



2 Bore lockset hole first using holesaw. Bore until pilot bit breaks through other side, then complete hole from other side.



3 Bore bolt hole next, making sure to keep bit aligned vertically and horizontally. Accuracy is crucial on this job.

door, stay just above the lockset that is already on your door. Hollow-core doors are reinforced near this lockset and, therefore, are strongest at door-knob level. Even if you have solid-core doors, stay near the lockset for the greatest strength.

When you buy your deadbolt, you will find directions that include the exact drill bit sizes you will need. Make sure you have bits to meet those requirements. Inexpensive, adjustable holesaws work fine. You will also find a paper template to help you mark the exact hole locations.

Getting down to work

The hole for the lock cylinder should be bored first. While you bore the hole, pay close attention to the angle of your drill and make sure that you bore straight in. Don't drift to the left or right. If you are working alone, block the door so that it remains steady and concentrate on a straight hole through the door. When

the larger hole for the lock cylinder is finished, bore the smaller bolt hole. Use the same procedure.

When the holes are bored, press the bolt in place and mark around the plate with a knife. Then, chisel out the plate area to the manufacturer's recommended depth. Next, press the lock cylinder into its opening from the outside and make sure that it catches the bolt. Installing a strike plate for a deadbolt is a little more involved than for a regular lockset.

Many deadbolts come with a reinforcing box to give the doorframe added strength. Measuring for this box is critical. Because doors often warp when in place, simply measuring from the bolt to the edge of the door and transferring those measurements to the doorjamb does not always work. A better way is to paint the edge of the bolt with lipstick and then, after closing the door, turn the bolt against the door frame. The lipstick will mark the exact spot where the bolt

will strike the frame. There's no going wrong with this tip.

Determine the exact center of the lipstick mark and take all measurements off of this point. When installing a reinforcing box, you will need to bore two holes and then trim them into a square hole for the box.

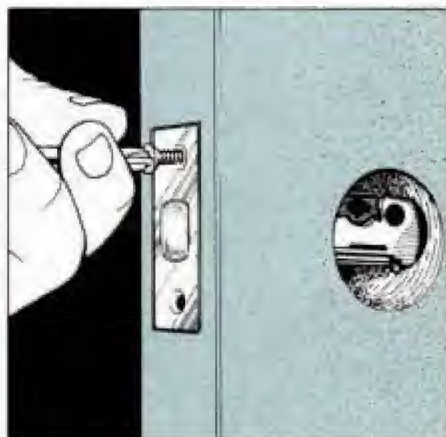
Chisel must be sharp

Even if no reinforcing box is included, you will have to chisel out a recessed area to accept the strike plate and a heavier, brass reinforcing plate. The total depth of these two plates will be near $\frac{1}{4}$ in.

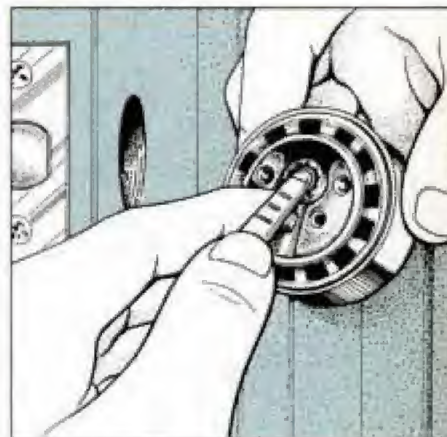
When doorframe is ready for the strike plate, reinforcing plate and/or reinforcing box, bore the screw holes. The reinforcing plate will come with heavy screws at least 3 in. long that will extend through the door frame and into the exterior wall studs. Install these and the screws for the strike plate and the job is complete. **FM**



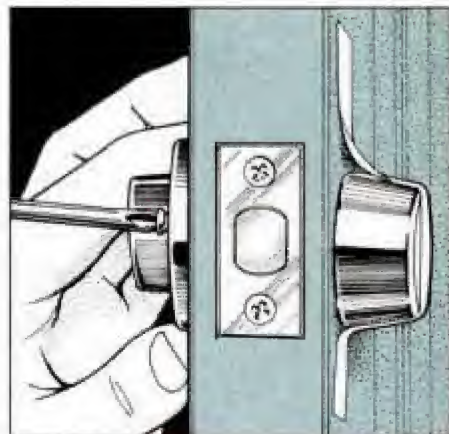
4 Trace bolt plate on edge of door, then mortise out door edge so plate will sit flush. Be sure to use a very sharp chisel.



5 Slide bolt into hole and make sure it fits flush on door edge. Prebore screw clearance holes, then attach with screws.



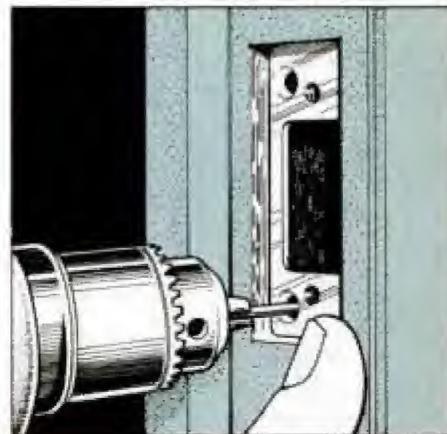
6 Deadbolt is activated by flat pin that joins both sides of lockset. Pin length can be adjusted to match door thickness.



7 Slide lockset and pin through deadbolt mechanism, then tape to door. Slide other half of lockset into place and attach.



8 Test bolt for proper operation, then when satisfied, coat end of bolt with lipstick, close door and slide bolt onto jamb.



9 Using lipstick mark as guide, mortise jamb to receive deadbolt hardware. When hole is complete, attach plates with screws.

How To Repair A BATHTUB DRAIN

Repairing a poorly working tub drain is one of those intimidating tasks for most people. All the important parts seem to be hidden under the tub or inside an adjacent partition wall. In practice, however, nothing could be further from the truth, because the working parts can all be removed, cleaned, adjusted and reinstalled from the outside. All you need to know is what type of drain you have.

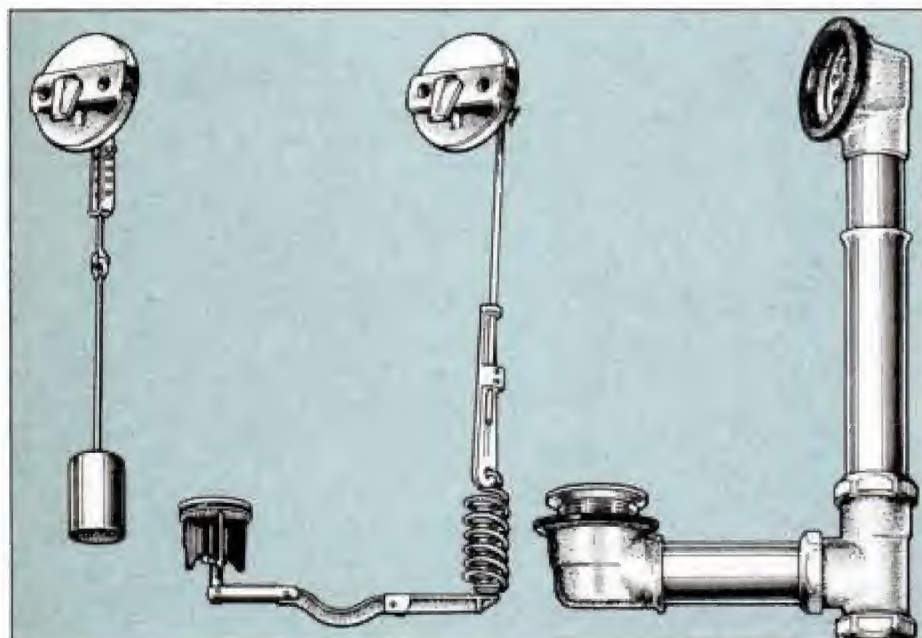
Tub drains, usually called tripwastes by plumbers, come in two basic styles with the same purpose, namely to close off the tub opening so the water does not drain until you want it to. The one on the left is called an internal plunger. When you flip the trip lever below the faucets, the plunger slides past a drain baffle in the overflow tube and prevents the water from passing into the drain system. This type of tripwaste calls for a

simple screen that covers the drain opening at the bottom of the tub.

The second type (below right) is called a pop-up tripwaste. When you operate its trip lever, it allows a drain stopper—positioned in the drain opening—to fall into the opening, closing it off and preventing water drainage.

In most cases, the tripwaste just needs to be cleaned and sometimes adjusted as shown below. Accumulations of hair and soap are the usual culprits. The hair becomes caught and the soap tends to bind it in place. If you force the trip lever when it's stuck, you can distort the mechanism's adjustment which will have to be repaired as well.

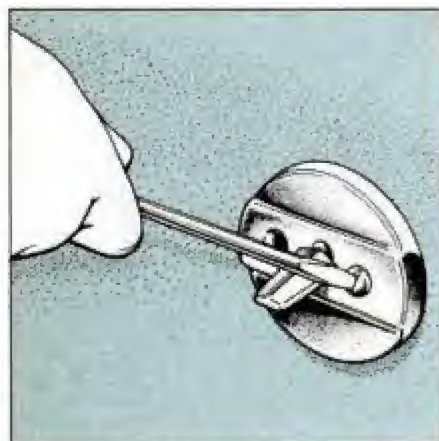
—Merle Henkenius



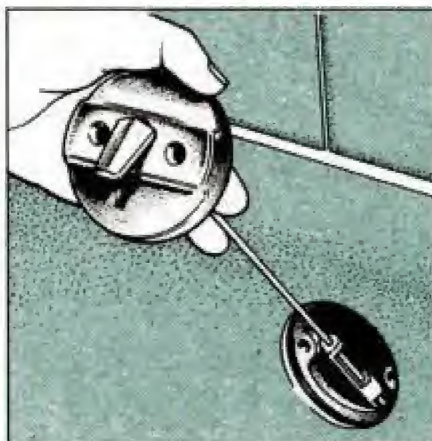
1 Two basic tripwastes are internal plunger (left) and pop-up model (middle). Both fit standard drain system (right) with vertical overflow and horizontal drain-opening tubes.



2 To clean plunger type, just remove screen. For pop-up (shown above) just pull mechanism from drain opening.



3 To remove plunger tripwaste—or vertical section of pop-up—unscrew overflow cover plate. It's attached to overflow tube.



4 Pull mechanism from overflow tube and clean thoroughly. Apply heat-proof grease, then reinstall and check operation.



5 If plunger or spring arm needs adjustment, move connecting rod on fitting and retighten. Reinstall and check.

Homeowners' Clinic

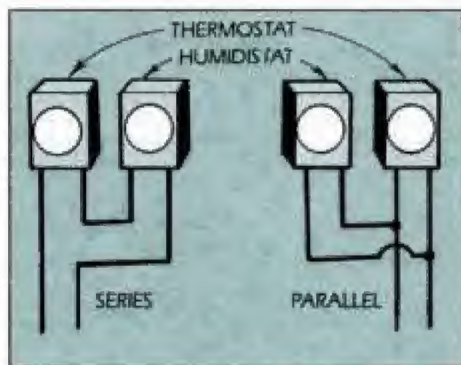
BY NORMAN BECKER, P.E.

Air-Conditioning Humidistat

What is your opinion on installing a humidistat in series with my air conditioner thermostat? Will this save on operating costs?

LEON MARKS
PLANTATION, FL

The amount of electricity saved will vary considerably with the user. A humidistat with dehumidification control (the contacts close when the humidity rises), such as the Honeywell model No. H46C1000 will do the job. It operates in the range of 20- to 80-percent relative humidity and sells for about \$45. There is a disadvantage in connecting the controls in series. In this case, both the humidistat and the thermostat contacts must be closed for the air conditioner to operate. If the relative humidity is low, the air conditioner will not run even though the room may be uncomfortably hot. When



Humidistats can be wired in parallel or series with the thermostat to allow your air conditioner to engage on high humidity.

the two controls are connected in parallel, the air conditioner will operate if the contacts on the humidistat or thermostat are closed. The condition that is met first, temperature or humidity, triggers the air conditioner. Here, you can use the air conditioner to control humidity by setting the thermostat to engage at a high temperature.

Severe Humidity

I have a severe humidity problem in my house which is 2 years old. The indoor relative humidity levels run 70 to 80 percent during the winter months. My double-glazed windows are constantly covered with moisture and the varnish is beginning to peel. The attic is vented by six roof vents and six eave vents. The walls contain 6 in. of Fiberglas insulation with plastic vapor barrier and there's 12 in. of cellulose insulation in the attic. To take care of moisture in the bathroom, I have a power vent to the outside. The range hood is not vented but there is only minimal cooking done on the range.

MIKE TRUAX
IRON, MN

It sounds as if you have a tight, energy efficient house. While this helps keep your heating costs in line, it inhibits fresh-air infiltration that would otherwise help to control humidity. Condensation problems often appear in the fall after the house has been exposed to the warmer moist air of the summer months. The moisture from this summer air is absorbed by every-

thing in the house including wood framing, walls, floors, clothes, furniture and so on.

When the drier, cool weather arrives, the house tends to dry out and thereby increases the relative humidity of the interior air. If the temperature at the windows is below the dew point, this moisture will condense.

If this is the cause for the moisture buildup in your house, it can be corrected by ventilating the rooms. Open the windows in each room for about an hour during the warmest part of the day. The dry outside air can then mix with moisture-laden household air and reduce the overall humidity.

There are other possible causes for moisture buildup in your house. If your basement takes on water after a rain, make sure it's pumped out as soon as possible. The water vapor will migrate up to the habitable portions of the house. The dirt floors in crawl spaces should be covered with 4- to 6-mil polyethylene sheets even if the soil feels dry. According to the Small Homes Council at the University of Illinois, a 1000-sq.-ft. house can re-

lease as much as 18 gallons of water per day through evaporation in the crawl space. Try to avoid storing firewood in your basement. As it dries, the moisture it loses will contribute to the relative humidity of the household air.

Another possible source for excessive moisture buildup in the house is a clogged heating-system chimney. One of the products of combustion in a gas-fired heating system is water vapor. If the chimney is clogged, the water vapor will pour into the house. This must be checked not only because of the moisture-level buildup, but because poisonous carbon monoxide could be leaking into the house as well.

Screening Sun's Rays

We live in a house out in the country in central Michigan. In the afternoon, the sun comes through the upper windows and casts across some rather good prints and paintings.

I would be very grateful for your advice on some form of window covering that would largely eliminate or screen the sun's harmful rays that have a fading effect on the pictures. Many thanks for whatever information you can supply.

ALBERT L. CATALLO
GRAND LEDGE, MI

The 3M Company has exactly what you want. They have a product line called Scotchtint Sun Control Films that will cut out about 99 percent of the ultraviolet rays which cause fading and drying of pictures, furniture and carpeting. The film also reduces summertime heat gain and wintertime heat loss. Scotchtint films are available in do-it-yourself kits or can be installed by authorized 3M trained service representatives. For information on your local Scotchtint Film distributor, write to Energy Control Products/3M, 220-8E 3M Center, St. Paul, MN 55101. **PM**

Do you have a home-maintenance or repair problem? Send it to Homeowners' Clinic, Popular Mechanics, 224 West 57th St., New York, NY 10019. Letters cannot be answered individually, but problems of wide interest will be discussed in the column. For more home-repair and maintenance help, get PM's Home Care Guide, \$2.45 postpaid. Send your order(s) to Popular Mechanics, Box 1014, Radio City Station, New York, NY 10101.

Appliance Clinic

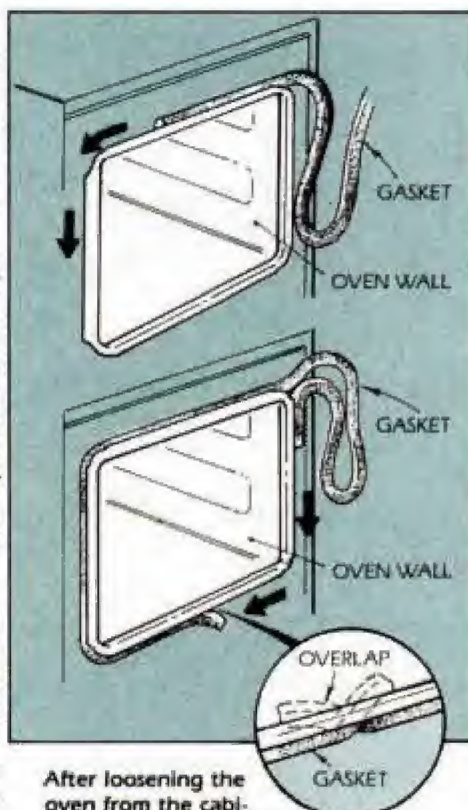
BY STEVE TOTH

Door Seal Burnout

I have a Gaffers & Sattler self-cleaning electric range model No. A38X2CW94, serial No. 03X009305206. The door seal is burned out. How do I replace it?

VICTOR LUCIANO
SAN LEANDRO, CA

You can purchase the door gasket (part No. 1313-279) from any Magic Chef parts distributor for about \$30. To install the new gasket, first remove the oven door. Notice that the gasket fits between the oven wall and the cabinet frame. Loosen the six screws located around the inside of the oven that fasten it to the frame. Hit the side of the oven gently with your fist to loosen it from the frame. Then pull the old gasket out. Starting at an upper corner, feed the new gasket across the top, down one side and then across to the center of the bottom of the oven. Now feed the other end of the gasket around the other side of the oven in the same way. Where the ends meet at the bottom, overlap the gasket and tuck the ends behind the oven cavity. Replace the six screws that hold the oven to the outside frame and install the door.



After loosening the oven from the cabinet, thread the gasket around oven wall. Tuck in ends behind oven cavity.

solenoid-operated valves—one for the ice maker and the other for the cold-water dispenser. It's easy to confuse the two. The ice-maker valve (Sears part No. 482531), is a slow-closing valve. The cold-water valve is quick closing (Sears part No. 839936).

Check the part number on the valve you installed against the above numbers. If it's the correct valve, try checking the water flow from the reservoir storage tank to the spigot. Make sure it's open and free from anything that could cause your after-flow condition. If you need to replace the tubing, order Sears part No. 807200.

Popping Fridge

I have a Gibson refrigerator model No. RT4C1DEDG, serial No. C92844605. It makes a loud popping noise 10 or 12 times a day. I'm worried that the copper tubing might rupture and leak.

FELIX FLORES
SOMES BAR, CA

Your noise is probably related to expansion and contraction of metal parts during the automatic defrost cycle. The refrigerator is equipped with an electric heater that comes on after 8 hours of compressor operation. This heats the aluminum cooling coil to about 50° F and melts off any ice. During this cycle, the parts will expand. When the compressor comes back on, the coils cool and contract.

There's a sound-level kit (Gibson No. G-166510) available that will muffle the noise. The kit consists of insulation which is added between the cooling coils and the back of the refrigerator. It costs about \$3 at Gibson service centers. To install this kit, first unplug the refrigerator and remove the evaporator cover. Then, disconnect the evaporator fan motor and position the insulation behind the evaporator. If you feel unsure of this operation, call your local Gibson service company for professional help.

FM

Still Ticking

The problem is a knocking noise in the gears of our Maytag wringer washer. We paid a serviceman just to tell us to run it until it stops. I understand Maytag has stopped making wringer washers. Do you think we could still get parts?

THOMAS W. CAMPBELL JR.
PHILADELPHIA, PA

Maytag discontinued manufacturing wringer washers in November 1983. However, all functional (noncosmetic) parts for these units are still stocked. It's difficult to know what's causing the knocking. I suspect it's coming from the transmission. The gears may be worn, or may need lubrication.

I suggest you call Maytag at 1-215-568-5910 to get the name and address of the Maytag service company nearest you. If you feel like taking on the job yourself, pick up a wringer washer service manual (part No. 56-127) from any Maytag parts dealer for

about \$3. It explains how to remove the transmission. You can then send it to the Maytag Co., Newton, IA 50208, Attn: Customer Service. Include a letter explaining the problem.

Water Torture

I have a Sears Coldspot automatic refrigerator with an ice maker and cold water dispenser, model No. 106.7618440, serial No. E13409860. Three years ago the dispenser spigot started to leak when turned off. I replaced the solenoid and valve unit and the leak stopped. Recently, the leak reappeared and I replaced the same parts once again. However, I found the water continued to run for 2 or 3 seconds when I released the dispenser switch. I tried replacing the solenoid valve again with the same results.

JOHN BANNON
KANSAS CITY, MO

Your refrigerator uses two separate

If you have a problem with any appliance, send your question, along with the model and serial numbers, to Appliance Clinic, Popular Mechanics, 224 West 57th St., New York, NY 10019. Sorry, but letters cannot be answered individually. Problems of wide interest will be discussed in this column.



Makers of the World Famous T-50 Staple Gun

Now Brings You A Full Selection Of Professional Quality Fastening Tools For All Your Fix-It Fastening Needs!



Model ETN-50
Electro-Matic
Professional
Quality

ELECTRIC STAPLE GUN

FLUSH
FRONT
EXTENDED NOSE

Permits easy fastening in
recessed areas, close corners,
and other hard-to-get-at places
with pin-point accuracy!



Model T-50XP
XPANDO
FASTENING SYSTEM

Attachment & Fasteners
Instantly converts the Arrow
T-50, T-50M, or T-55 Staple Gun
into a multi-purpose
fastening tool!

Easily slips on front of Staple Gun!



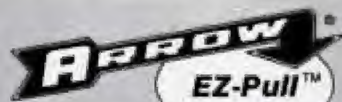
HOT MELT GLUE GUNS

Model
TR-550
Professional
Automatic Lever Feed
HOT MELT GLUE GUNS

- Electronic Solid State
Hi-Impact/Hi-Temp Housing
- 4 Types of Glue Stix available
- Uses 2" or 4" Glue Stix
- Cool contoured handle
- Interchangeable nozzle
- Re-usable storage box
- Light weight
- Uses 4 types of Glue Stix
- Built-in Drip Tray/Stand



Model TH-500 Thumb Feed



Rivet Tool

Model RH-200
Professional
E-Z Pull RIVET TOOLS

- Extended nose for hard-to-get-at places
- Uses 4 rivet sizes: 3/32", 1/8", 5/32", and 3/16"
- Spring-loaded handle for easy rivet loading and ejection
- All steel construction
- Comfortable vinyl grip
- 4 nose pieces with wrench
- Handle locks when not in use



Model RL-100 Light Duty



ARROW FASTENER COMPANY, INC.

271 Mayhill Street, Saddle Brook, NJ 07662

In Canada: Jardel Distributors, Inc., 6505 Metropolitan Blvd. East, Montreal H1P 1X9 Quebec

Available at all leading Hardware, Home Center, and Discount Department Stores everywhere.



Piece-Keeper

An easy-to-build small-parts cabinet.

BY ROSARIO CAPOTOSTO, Contributing Editor

How many times have you spent about 20 minutes searching for a specific box of screws or the brass escutcheon pins you bought last summer—you know they're in the shop somewhere—only to discover that the box is nearly empty and the hardware store is, of course, closed. Well, take heart, because for most shopworkers, keeping organized is an ongoing struggle. This is true especially when it comes to organizing the hundreds of small parts required for all types of shopwork.

In an effort to end some of the chaotic clutter, we present this simple 6-drawer, roll-around storage cabinet. The easy-to-build cabinet provides storage for 120 items such as screws, nails, nuts, bolts, wood dowel pins, plugs and other hard-to-find parts. Each drawer holds 20 9-ounce clear plastic cups. The inexpensive cups are available at supermarkets and convenience stores. Unlike most small-parts cabinets, this system allows you to remove a cup and bring it right to the workbench or job site. And, since the cups are clear, it's

easy to identify the contents and determine when to refill.

The cabinet also features a built-in, adjustable-height steel roller housed behind the drawers. Use the roller to support workpieces on the outfeed side of our portable power-tool table

the drawer panels that hold the cups. Use solid maple for the drawer guides, drawer faces, cabinet trim and as edge band to conceal the plywood laminations. Note that the 2 1/4-in.-thick post (part L in Materials List) that supports the roller is made by gluing three pieces of 3/4-in. maple plywood.

Begin by cutting the cabinet's plywood panels, to the dimensions given in the Materials List, using a portable circular saw. This includes the sides, back, partition and top and bottom. Next, glue 1/8-in.-thick × 3/4-in.-wide maple edge band to the edges of the plywood panels, as indicated by the drawing. Only the partition (D) does not receive edge banding. An easy way to "clamp" the edge band in place until the glue dries, is with masking tape (see

photo 1). Before assembling the cabinet, bore a 1-in.-dia. access hole in the partition so that you can take out the carriage bolt and remove the roller assembly, if necessary. Also, glue and nail two post guide strips (K) to the partition. Then, cut a 1/2-in.-wide × 12 1/2-in.-long slot in the back panel to accommodate the carriage bolt. To do this, first bore two 1/2-in.-dia. holes to establish the top and bottom of the slot. Then, make two parallel plunge cuts with a circular saw to establish the slot width. Cut through the last bit of wood with a sabre saw (photo 2).



Cabinet features an adjustable-height outfeed roller that stores behind the drawers. Use roller to support long boards when working on the torsion-box workbench or power-tool table.

or a standard table saw, planer and jointer. The roller can be adjusted to hold oversize stock when you're working on the torsion-box workbench, too. Note that the compact, portable cabinet requires less than 4 sq. ft. of floor space and stores neatly against the workbench.

Cabinet construction

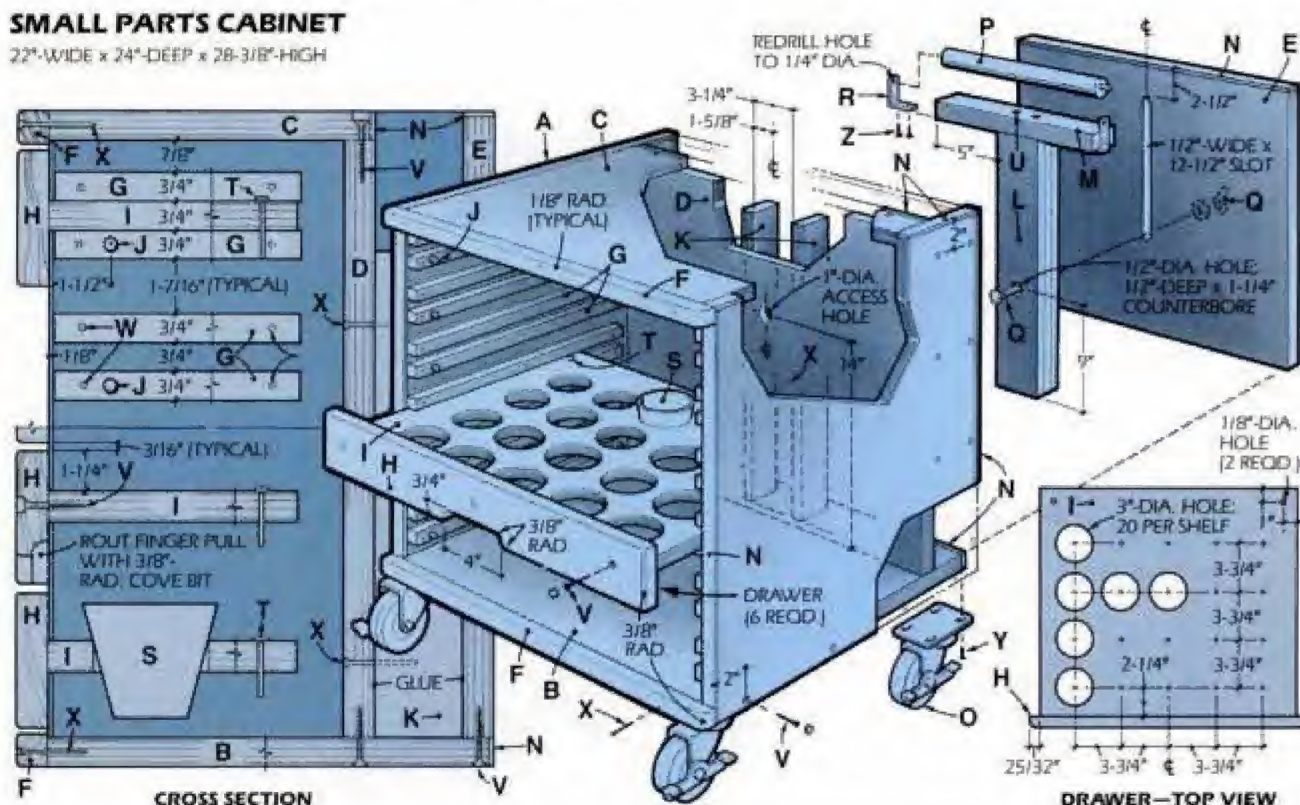
As with the other projects in the Shopwork Guide, this cabinet can be constructed using portable power tools. Build the cabinet from 3/4-in. maple-veneer plywood. Use less expensive lauan mahogany-veneer plywood for

Compact and portable, this small-parts cabinet (left) utilizes clear plastic cups for storing nails, screws, nuts and other hard-to-find items. Cabinet houses 120 cups.

Cabinet design: Rosario Capotosto
Color photo: J.R. Rost
Black-and-white photos: Rosario Capotosto
Technical artist: Eugene Thompson

SMALL PARTS CABINET

22"-WIDE x 24"-DEEP x 28-3/8"-HIGH



MATERIALS LIST—SMALL PARTS CABINET

Key	No.	Size and description (use)
A	2	3/4 x 22 1/16 x 23 1/8" maple plywood (cabinet side)
B	1	3/4 x 20 1/2 x 23 1/8" maple plywood (cabinet bottom)
C	1	3/4 x 19 1/16 x 20 1/2" maple plywood (top)
D	1	3/4 x 20 1/2 x 22 1/8" maple plywood (partition)
E	1	3/4 x 20 1/2 x 23 1/8" maple plywood (back)
F	2	1 1/16 x 3/4 x 22" maple (trim)
G	24	3/4 x 3/4 x 18" maple (drawer guide)
H	6	1 1/16 x 3 1/2 x 22" maple (drawer face)
I	6	3/4 x 18 x 20 1/16" lauan plywood (drawer)
J	12	3/8"-dia. x 1 1/2" hardwood dowel

K	2	3/4 x 2 1/4 x 20 1/2" maple plywood (drawer stop)
L*	1	2 1/4 x 3 x 20 1/2" maple plywood (post)
M	1	1 1/4 x 2 1/4 x 13" maple (roller support)
N	1	1/4 x 3/4"-wide maple (edge band)
O**	4	caster with brake
P***	1	1 3/8"-dia. x 13" steel roller
Q	1	1/2"-dia. x 3 1/2" bolt, washer and wingnut
R	2	2 1/2" corner brace
S	120	9-oz. clear plastic cup
T	12	6d common nail cut to 1 1/2" long (stop)
U	2	2" No. 12 fh screw; 1/2"-dia. maple plug
V	1	1 1/2" No. 8 fh screw; 3/8"-dia. maple plug

W	3d finishing nail
X	6d finishing nail
Y	16 1" No. 12 panhead self-tapping screw
Z	4 1" No. 8 fh screw
Misc:	Carpenter's glue, 100-, 120- and 220-grit sandpaper, satin-finish polyurethane varnish.
*Form post	by laminating together three pieces of 3/4 x 3-in.-wide maple plywood.
**Casters	are available from Armor Products, Box 445, E. Northport, NY 11731; set of four casters (No. 76003) costs \$72 postpaid.
***Steel roller	(No. 76302.01) is sold by Garrett Wade, 161 Avenue of the Americas, New York, NY 10013, for \$8.10 postpaid each.

Assembly procedures

Bore screw-shank clearance holes and 3/8-in.-dia. x 3/8-in.-deep wood-plug holes at each screw location. Glue and screw together the cabinet with 1 1/2-in. No. 8 screws. Conceal each screwhead with a 3/8-in.-dia. maple plug. Next, make the T-shaped post that supports the outfeed roller. Attach the roller to the cross support with two corner braces (R). Cut 3/4 x 3/4 x 18-in. drawer

guides (G) from maple stock. Each drawer panel slides between two pairs of guides.

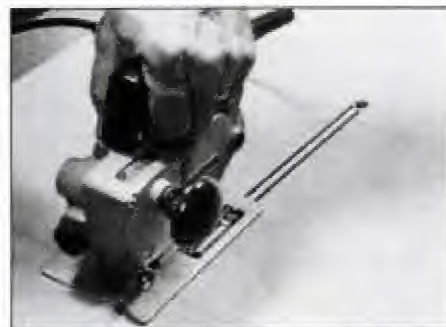
Bore three pilot holes in each guide to accept 3d finishing nails. Also, bore a 3/8-in.-dia. x 3/4-in. hole 1 1/2 in. from the end in 12 of the guides.

The holes accept 1 1/2-in.-long dowel rod sections that act as drawer stops (J). Be sure to use these 12 parts as lower drawer guides.

When installing the guides, use spacer blocks to maintain uniform spacing. Use a 1 1/16-in.-wide spacer block to separate one pair of drawer guides from the next. Use a 3/4-in.-wide spacer between the upper guides and the lower guides. Wrap three thicknesses of masking tape around the 3/4-in. spacer to create clearance for the panels to slide (photo 6). Glue and nail the guides to the cabinet sides. Note that the



1 Use 1/4-in.-thick maple edge band to conceal the exposed plywood edges. Tape the edge band in place until the glue dries.



2 To form the bolt slot in cabinet back, first bore two holes, then saw out the waste using a portable circular saw and sabre saw.



3 Before attaching the partition to the cabinet, bore a 1-in.-dia. bolt access hole and attach two plywood post guide strips.

WORTH WRITING FOR

336 PLUG INTO POWER-ANYTIME, ANYWHERE

Honda's color brochure offers a wide range of generators, from 650-watt portable units to high-power 6500-watt models. Plus, Honda's full line of mowers, snowthrowers, pumps and more. Free

337 NEED MORE SECURITY?

Kwikset's full-color "Door Hardware Selector Guide" presents doorknob, lever and entrance designs. The latest law-enforcement recommended deadlocks that can be added to existing residential doors as an added burglary deterrent also featured. 25¢

338 THE WINNER'S EDGE

Four Winns has been manufacturing fiberglass powerboats for nearly a quarter of a century. Now it would like you to know about its "Winner's Edge Owner Protection Plan" and how it gives owners an additional two years of coverage at no extra cost. Free

339 NO MESS PAINTING

Paint worry-free with new Tape 'N Drape™—the poly-dropcloth and masking tape all in one! Daubert Coated Products, Inc. offers brochure describing how painting can be done quicker and easier with no need for time-consuming clean-up. Free

340 YOUR BEST SHOT

Nikon riflescopes can make every shot count, especially for that once in a lifetime trophy. Detailed information and literature about the accuracy, light gathering ability and affordability of Nikon's premiere scopes. Free

341 FREE WATER QUALITY TEST

Don't take your water for granted, send for your free water test bottle today. Rainsoft will analyze and return a test report. Plus, a color brochure explaining the benefits of its water treatment system. From Rainsoft Water Conditioning Co. Free

342 CRUISE IN COMFORT!

Buckle up for safety with Comfort Wrap™. Soft, washable, and attractive padded seat belt cover that attaches with Velcro™ strips is available in many colors. Brochure from V&H Sales Service. Free

343 MICKEY'S BOATS

Cobia is the official boat of Walt Disney World. Catalog illustrates models, including the Sun-Skiff 177 outboard with casting platform and tackle box. Free

344 STROKE ON STAINING

Information from New York Bronze Co. gives details about the One Stroke Woodgrain Refinishing Kit. A basecoat, grain coat and finish coat all in one. Use on wood, metal and plastic. Free

345 CABINET CLUTTER?

Amerock's "Cabinet Aides" brochure illustrates in full-color several ways to accessorize kitchen cabinets for greater convenience. Storage organizers include undersink pullout racks, undercabinet pull-down units for cookbooks, knives, spices, messages. Free

346 AIR COMPRESSORS AND MORE!

Campbell Hausfeld's color catalog has a full line of U.L. listed portable air compressors. From ½ HP to 5 HP for every homeowner's needs. Also, compatible tools and accessories for sandblasting, fastening, painting, home repair & more. Free

347 BUILD YOUR PLACE IN THE SUN!

ODL's 16-page, color brochure details every step in assembling the Sunspot™ room. Uses interlocking panels that form an exceptionally strong, weather-tight living area. Ideas on where to erect and how to accessorize. \$1.00

348 PRECISION GARDENING

The 20lb. Mantis Tiller/Cultivator is for every garden—from a flower patch to an acre of vegetables. Speed-weeds a sensible nine inches wide. Informative literature packet also shows options to make other lawn care chores a breeze! Free

349 "RENTING" CAN MAKE IT EASIER

Have a home improvement project in mind, but you don't know quite how to do it? A 10-page booklet, "Discover Renting," from the American Rental Association contains "how-to" tips for the DIY'er and explains how renting the proper tools and equipment can make your life easier. 50¢

350 MASTER SHOP GUIDE

An A to Z guide to nails, screws, moldings, sandpaper, wallpaper, lumber, floor tiling, wood finishings and more. Printed on large laminated cards that can hang in your workshop for fast reference. From POPULAR MECHANICS. \$5.95

351 OVERBOARD ON OUTBOARDS

Mariner's 1987 full line of 2 to 220 hp outboards includes the first electronic fuel injected outboard. Also new for '87 are 3 cylinder 75hp and 90 hp loopcharged outboards and 9.9 hp outboard. Fully illustrated, 4-color catalog. Free

352 BLINDS FOR DESIGNING WINDOWS

Bradd & Hall Associates offers their latest color brochure on a wide selection of Levolor window treatments to add a designer touch to your home decor. Plus, information package on how to measure for custom & ready made blinds. Free

353 FINE WOODS AND WOODWORKING SUPPLIES

A woodworker's delight, Constantine's 116-page, color catalog offers 150 kinds of veneers and 250 sizes of fine cabinet woods. Plus, decorative inlays, mouldings, tools, plans, books and hardware. \$1.00

354 ALL CHARGED UP

28-page color catalog features batteries and accessories for motorcycles, ATV's, snowmobiles, water sport vehicles and scooters. Includes feature/benefit pages, specifications, applications, service and maintenance details. From Yuasa-General Battery Corp. Free

355 PROFESSIONAL PAINTING RESULTS

Greenline Painters'™ Tape masks for error-free painting results. No drips, mess, runs or worries. Use on wood, vinyl wallpaper, carpet, trim, interior and exterior walls. 4-color brochure from Manco. Free

356 CONSUMER GUIDE TO CEILINGS

Armstrong's color brochure illustrates options for remodeling with an attractive tile or suspended ceiling. Want peace and quiet? Select an acoustical ceiling that absorbs a minimum of 45% of the noise striking its surface. Wide variety of patterns. Free

357 ROUTER BITS

Robert Bosch's router bit catalog details over 230 carbide-tipped and steel bits engineered for performance. Featured: straight, edge, groove forming, laminate trimming and specialty bits for plastics, dovetails and more. Free

358 BAY CRUISERS

For 1987, Bayliner offers an exciting lineup of America's favorite pleasure boats, 14-15 feet. They're all top quality, loaded with standard features, at prices starting under \$5,000. Free

359 HOME CARE GUIDE

Make home repairs easy. This informative guide, with over 125 illustrations, helps you fix plumbing and electrical problems, silence squeaky floors, water-proof your basement, even hang wallpaper. 19 topics in all! Printed on large plastic-coated cards. From POPULAR MECHANICS Price: \$2.45

360 TUNING TIPS

Holley presents the latest data available from the development and testing programs of its Replacement Parts Division. Tips on diagnosing and repairing engine parts for DIYers. Also, new products. Free

Popular Mechanics 7/87

Box 1718, Sandusky, Ohio 44870

Please see that I receive the items checked below

- | | | | | | |
|----------------------------------|------------------------------|-------------------------------------|-------------------------------------|-------------------------------------|-------------------------------------|
| <input type="checkbox"/> 336 | <input type="checkbox"/> 341 | <input type="checkbox"/> 345 | <input type="checkbox"/> 349 50¢ | <input type="checkbox"/> 353 \$1.00 | <input type="checkbox"/> 357 |
| <input type="checkbox"/> 337 25¢ | <input type="checkbox"/> 342 | <input type="checkbox"/> 346 | <input type="checkbox"/> 350 \$5.95 | <input type="checkbox"/> 354 | <input type="checkbox"/> 358 |
| <input type="checkbox"/> 338 | <input type="checkbox"/> 343 | <input type="checkbox"/> 347 \$1.00 | <input type="checkbox"/> 351 | <input type="checkbox"/> 355 | <input type="checkbox"/> 359 \$2.45 |
| <input type="checkbox"/> 339 | <input type="checkbox"/> 344 | <input type="checkbox"/> 348 | <input type="checkbox"/> 352 | <input type="checkbox"/> 356 | <input type="checkbox"/> 360 |
| <input type="checkbox"/> 340 | | | | | |

This Coupon Expires September 30, 1987

Total money for priced items \$ _____

Service Charge \$ _____ .50

Total money enclosed \$ _____

Total items requested _____

Name (Please Print) _____

Address _____

Town _____ State _____ Zip Code _____

(Please send cash, check or money order made out to POPULAR MECHANICS. No stamps, please)

Note: Popular Mechanics processes your requests for the above information and forwards these inquiries to the organization making the offer. Each company mails the material directly. Your order will be on its way to you within 90 days.

PSSSSSSST!!!

SEE the Most Affordable
Helicopter in the World!
ON VIDEO!!



Just imagine yourself in the cockpit of your own personal helicopter! A helicopter that you can actually AFFORD to OWN and FLY! The RotorWay Exec is revolutionary in design, incorporating state of the art features found in helicopters costing 10 times as much, yet it sells for less than the cost of a luxury sports car! Find out more! Order our updated information packet, or "THE EXEC EXPERIENCE" video tape. It's an action filled hour long production packed with information, education, historical aviation footage and flight maneuvers along with a dynamic sound track!

In our beautifully illustrated information packet you'll find an exciting full color brochure, a step by step description of the RotorWay program, 3-view drawings, 3 fold out wall posters, pricing details and a special offer. At last...your own affordable helicopter!...order your Video Tape or Information Packet today!!

208 Credit Card Customers—To Order Package—

CALL TOLL FREE NOW!

U.S. (Alaska, Hawaii, and the Virgin Islands)

1-800-345-9080, Operator 169 TELEX 683-5059
Charge to MC, Visa, Am Ex., Exp. Date

Send me the items checked below:

"Video tape available overseas"

1 HOUR VIDEO TAPE & INFORMATION PKG.

Specify: VHS Beta \$59.95

Video Tape Only \$49.95

Information Package Only \$12.00

Arizona residents add 6 1/2% sales tax.

(Overseas orders add \$10.00 postage)

NAME _____

BUS. OCCUP. _____

ADDRESS _____

CITY _____ STATE _____ ZIP _____

7PMZ

ROTORWAY AIRCRAFT, INC.

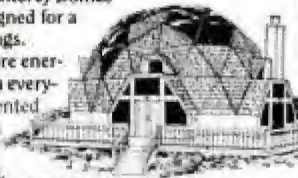
7411 W. Galveston, Dept. 7PMZ, Chandler, AZ 85226

DOMES HOME KITS

Spacious...Efficient...

Affordable...Monterey Domes
Homes are designed for a
lifetime of savings.

Up to 50% more energy
efficient than every-
day homes. Patented
building system
comes pre-cut
and color coded.



Send for 100 page color
Catalog & Plans Book. \$7.00.
Fully Guaranteed!

MONTEREY DOMES

Please rush my Monterey Domes Catalog & Plans Book. Enclosed is \$7.00.

Also, send me the Basic Dome Assembly Manual for an additional \$5.00.

Name _____

Address _____

City/State/Zip _____

Send To: MONTEREY DOMES

1766 Chicago Ave. Dept. AQ-7

Riverside, Calif. 92517

Credit card orders call
800-634-9255
or Calif. 800-647-6601

CABLE T.V. CONVERTERS

WHY PAY A HIGH MONTHLY FEE? All
Jerrold, Oak, Hamlin, Zenith, Scientific
Atlanta, Magnavox and all specialized
cable equipment available for shipment
with 24 hours. For fast service MC/VISA
or C.O.D. telephone orders accepted
(312) 658-5320 60 Day Warranty (Quantity
Discounts) 9 A.M. to 6 P.M. Monday
through Friday Central Time. Stamp En-
velope (60¢ postage) for FREE Catalog.

Midwest Electronics Inc.
5143 W. Diversey • Chicago, IL 60639
No Illinois Orders Accepted

SHOPWORK Guide

Piece-Keeper

uppermost guide on each side is 3/4 in.
from the underside of the cabinet top.
Finally, glue the dowel-rod stops into
the holes bored in the lower guides.

Next, cut six drawer panels (I).
There's no quick, easy way to cut out
the 120 3-in.-dia. cup holes—20 per
panel—but here's the method I used.
First, bore 1/4-in.-dia. holes at each hole
center. Then, use a 3-in.-dia. holesaw in
an electric drill and bore halfway
through the panel. Turn over the panel
and complete the cut. Sawing from both
sides makes it easier to remove the
waste plug from the holesaw. Bore
holes in the back corners of each panel
to receive pins (T) made from 6d com-
mon nails. The pins, when inserted in
the holes, will hit against the protrud-
ing dowel-rod stops when the drawer is
opened fully. Lift the pins to remove



4 After the partition is in place, install the
cabinet top. Assemble the cabinet parts
with glue and 1 1/2 in. No. 8 wood screws.



6 Wrap spacer block (arrow) with three
thicknesses of tape to provide clearance for
the drawer panels to operate smoothly.



8 Clamp together all the drawer faces and
use a 3/8-in. rounding-over bit to rout a
radius on both ends of each drawer face.

the drawer from the cabinet.

Now cut six drawer faces (H) from
maple stock. Use a sabre saw to cut a 3/4
× 4-in. handgrip in each face. Then,
rout a recessed finger pull—on the
backside of each face—around the
handgrip, with a 3/8-in. cove bit. Rout a
radius on both ends of each drawer face
with a 3/8-in. rounding-over bit. Clamp
the faces together and rout them all at
once (photo 8). Glue and screw the faces
to the drawer panels. Attach four lock-
ing casters to the cabinet's bottom. The
overall height of the casters is 4 1/4 in.

Next, finish-sand the cabinet and
apply one coat of polyurethane varnish
thinned one part thinner to six parts
varnish. Then, apply two full-strength
varnish coats. Sand lightly between
coats with 220-grit sandpaper. Install
the steel-roller assembly and secure it
with a carriage bolt and extra-large
wingnut. Finally, install the drawers
and drop in the cups. **PM**



5 This shows outfeed roller assembly ready
for installation. Note that carriage bolt is in
place before the cabinet back is attached.



7 Cut cup holes with a drill and holesaw.
Saw halfway through, turn over panel and
continue sawing to remove the waste.



9 The roll-around cabinet has four swivel-
ing, locking casters and six drawers. Each
drawer houses 20 clear plastic storage cups.

NEW! WHERE SCOTCH-GUARD™ STOPS ...NEVER-STAIN™ STARTS

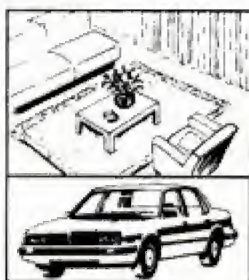
INVISIBLE FABRIC PROTECTION NEVER-STAIN™

JUST ONE SPRAY TREATMENT AND
IT'S STAIN FREE FOR AT LEAST
TWO FULL YEARS...GUARANTEED!

OVER 3 MILLION TREATMENTS SOLD BY
DEALERS FOR HUNDREDS OF DOLLARS—
NOW OFFERED DIRECT FOR ONLY . . .

\$9.95

Do not confuse this new product with SCOTCH-GUARD™ or any other repellent or water-proofing product. NEVER-STAIN is an invisible fabric protector with unique chemical protectants—when sprayed on carpet, couch or any fabric, these protectants permeate each fiber to form an invisible odorless shield that nothing can penetrate . . . not even the constant wear and tear areas made by plodding feet on carpeting and flooring—and NEVER-STAIN adds life to rugs or any fabric. Actually increases fabric life. Other water-proofing solutions are temporary—NEVER-STAIN is PERMANENT for at least 2 full years guaranteed—and is non-toxic, completely safe.



FURNITURE
fabric color and natural texture are preserved. Even silk or velvet.

CARPETS
are easier to clean, last longer, without trapped-in soil.

CAR INTERIORS
are given the same protection a new car dealer would charge \$100 or more for.



BEFORE



AFTER

HOTELS • OFFICE BUILDINGS • INDUSTRIAL
FACTORIES & DEALER INQUIRIES INVITED

NOT SOLD
IN STORES

- RUGS • CURTAINS
- SOFAS • DRAPES
- TABLE LINENS
- UPHOLSTERED FURNITURE
- CAR INTERIORS

**NOTHING STAINS
"NEVER-STAIN"**

- NOT SOIL • NOT COFFEE
- NOT OIL OR GREASE
- NOT FOOD (Even Grape Juice)
- NOT EVEN PET STAINS . . .
NOTHING!

TRADEMARK OF MMM CORP. © 1987 NC CORP.

NEVER-STAIN Dept. 282
10-10 44th AVE., L.I.C., NY 11101

Yes, rush my Never-Stain. I understand that if I am not delighted in every way, I can return the unused portion for a refund exclusive of postage & handling.

- ☐ One bottle (8 fl. oz.) \$9.95 plus \$1 postage & handling.
☐ SAVE! Two bottles \$18.00 plus \$1 postage & handling.

Enclosed is \$_____ check or M.O.
OR, charge to my ☐ VISA ☐ MASTERCARD

Acct. # _____ Exp. _____

Name _____

Address _____

City _____ State _____ Zip _____

NY residents please add sales tax.
All orders processed promptly. Shipment
guaranteed within 60 days.

Free Workshop Manual And Drawings On How To Make PVC Pipe Furniture For Fun and Profit

No

You don't have to pay \$15.00 or \$25.00 for a book on How to Make PVC Pipe Furniture, only to find out too late the author didn't know what he was talking about. And all he was interested in was selling you a book and really didn't care if you ever made any PVC pipe furniture.

We Do Care

Because our business depends on it. We are the largest manufacturer and distributor of furniture grade PVC pipe, fittings, slings, cushions, and fiber-glass table tops. Selling wholesale directly through the mail.



No Minimum Order

Is required. You can order one cushion or 500. Our business was built on the idea that there were thousands of people who would like to make PVC furniture for fun or profit, but could not afford to buy in large quantity the way many manufacturers require. This idea, we're happy to say, has started over 50,000 people making PVC pipe furniture for fun and profit.

Free Manual

Plus detailed shop drawings with pictures and measurements on How to Build PVC pipe furniture to all our new customers. This shop manual was written by P.E. Brancato, Sr., who has been building PVC pipe furniture for years. His manual has been widely accepted as the best Beginners Workshop Manual ever written, with over 500,000 in circulation.

Tools Needed

To start are very simple hand tools. A hack-saw and measuring tape is all you really need. But more important, you must enjoy working with your hands. If you are all thumbs you should not try building PVC pipe furniture. Any do-it-yourselfer however can easily learn the basics in two or three days.

No Franchise Fees

Or any kind of fees are charged by us. You only pay for the material you order, in the quantity you want. If you find you really like the PVC furniture business and want to get serious about it, we will gladly sit down with you and discuss our dealership arrangement and protected territory requirements.

Your Income

Will depend mainly on how much you want to work. But, let me say now you are not going to make \$30,000.00 a year or \$1,200.00 a week to start. We have found that a beginner will average \$20.00 an hour for their labor. So if you work all day on a Saturday, you can conservatively expect to make \$160.00 for the day. We do have many dealers who make a very good income, but they

work at it full time. In fact, we have a very fine 85 year old gentleman in Georgia named Steve Manor who puts many of us to shame.

To Help You

To understand the PVC pipe furniture business, we have put together a sample package of our products, which includes furniture grade PVC pipe, fittings, and color samples of the fabric the cushions are made of. Plus our catalog and price list that we charge \$15.00 for. This way you will be able to see what PVC furniture grade pipe and fittings look like, and the type of material used to make the cushions. Plus learn the different terminology used in the PVC pipe furniture business. As a bonus to you, to help you get started, we will refund the \$15.00 on your first purchase.

How Do You Start

1. Decide if you like to work with your hands and would like to make PVC pipe furniture for fun and profit.
2. Can you afford \$15.00 for our sample package of furniture grade PVC pipe, fittings, color samples, catalog, and price list?
3. To receive your free Beginners Workshop Manual, written by P.E. Brancato, Sr., send your name and address along with your check for \$15.00 to:

Leisure Products by BB
P.O. Box 3171 P
Apollo Beach, Florida 33570
Phone (813) 677-8280

PLEASE ALLOW TWO WEEKS FOR DELIVERY
©LEISURE PRODUCTS BY BB 1987

1/2 Million Bics Sold Daily



NEW! Bic Lighter Vending Machines!

Let America's 50,000,000 smokers line your pockets with money.

GROUND FLOOR OPPORTUNITY
to be the first in your area to own and operate a vending route.
Placed next to all cigarette machines.

PART OR FULL TIME

- ★ ALL CASH BUSINESS
- ★ NO SELLING
- ★ NO EXPERIENCE NECESSARY
- ★ INVESTMENT SECURED BY EQUIPMENT
- ★ NATIONAL ADVERTISING
- ★ FINANCING AVAILABLE O.A.C.

LIMITED WORLDWIDE DISTRIBUTORSHIPS

Call 24 hours for free brochure

1-800-722-4773

In California call (714) 894-1889

Vendgood Manufacturing Corp., Dept. PM7
5011 Argosy, #5 • Huntington Beach, CA 92649

Not affiliated with Bic Corp.

AUTOMOBILE TUNE-UP VIDEO TAPES

You don't need prior experience to tune your car like a pro; just a few basic tools (we'll tell you which ones) and the In-Tune Video Manual whose master mechanic will take you through a complete tune-up, step-by-step. You'll learn — and see — everything you need to know from timing to wheel bearing adjustment in 60 crystal clear minutes of video instruction.

THERE'S AN IN-TUNE VIDEO MANUAL FOR:

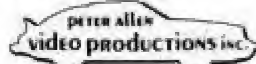
- | | |
|--------------------------------------|---|
| • Alfa Romeo | • Porsche 911 944 |
| • BMW 318, 320, 6 Cyl | • Saab 900 |
| • Nissan Sentra, 210, 240, 260, 280Z | • Toyota Cressida, Supra, Celica, Corolla |
| • Honda Accord | • Volkswagen Rabbit, Quantum |
| • Jaguar 6 Cyl | • Volvo GL, DL |
| • Mazda GLC, B26, RX7 | • GM 8 Cyl |
| • Mercedes 450 (8 Cyl), Diesel | • Jeep 6 Cyl |

IN-TUNE VIDEO \$24.95
MANUAL ONLY (+ \$2.50 shipping)

TO ORDER CALL TOLL FREE

1-800-334-0854 Ext. 835

(24 hours a day, 7 days a week). VISA Master Card accepted. NYS Residents add sales tax. Money back guaranteed.



38-C Otis Street, West Babylon, NY 11704

WOODWORKING MACHINES 5 in 1 Combination

WITH ELECTRIC MOTOR WHICH DEVELOPS 3 HP.

- 34" LATHE
- 10" TABLE SAW
- 11 1/2" DISC SANDER
- 16 1/2" VERTICAL DRILL PRESS
- HORIZONTAL DRILL PRESS

NEW MODEL CENTURY XXI



VERY IMPORTANT

The only machine built with:
A. ALL CAST IRON TABLES
B. HEAVY DUTY DESIGN
C. DEVELOPS 3 HP MOTOR
D. BUILT AS AN INDUSTRIAL MACHINE

ONE PLACE FOR ALL YOUR NEEDS...

Toll Free (1-800) 421-2467

IN CALIFORNIA CALL COLLECT (213) 549-0761

☐ VISA ☐ MASTERCARD ☐ MONEY ORDER

MASTER WOODCRAFT MACHINE CO.

DEPT. PM, P.O. BOX 669
HARBOR CITY, CA 90710
(A Republic-Lagun Group)

ASIAN INVASION

(Continued from page 94)

Hyundai Excel

The success story of 1986 was Hyundai, and we looked forward to our first drive in this tremendously successful car. But our testers unanimously felt that the Hyundai was inferior to the mechanically identical Colt.

They complained about the interior's poor fit and finish, "no-feel shifter," "lackluster" engine and "twitchy" handling. Interestingly, the Colt and Excel were almost perfectly matched at the track, as they should have been. Our testers' negative impressions were totally subjective.

Chevrolet Spectrum

Our testers preferred the Spectrum to the Hyundai—and the Nova and LeMans, for that matter. But the Spectrum's poor track performance, when averaged with our road-test ranking, put it in last place. Realistically, if you were going to buy one of these cars, we'd certainly recommend the Spectrum over the Excel, and put it about on a par with the Nova and LeMans.

Our testers thought the Spectrum looked "smart and traditional." It comes across as "larger than it looks, honest passenger space makes it one of the better choices for a family car."

Unlike the Hyundai and LeMans, which elicited considerable negative comments from our testers, the Spectrum was judged to be relatively innocuous. As one tester summed up, "Yet another Japanese economy car that I can't get excited about."

Conclusion

In many ways, the current automobile market is like that in the '50s when independent importers were bringing in all sorts of small European cars, hoping to make a buck. Companies like Volkswagen, BMW, Saab and Volvo evolved into major importers, but cars like DKW, Skoda, Rover, Borgward and Austin never made it.

We've never put much faith in captive imports. It's all too easy for an American manufacturer to pull the plug on an unsuccessful marque, leaving you with an orphan strapped for parts and service, like owners of a Vauxhall, Opel, Fiesta, Capri, Simca, and LUV have found out.

However, there's a difference in this group of captives. Even if Chrysler walks away from the Colt, you could still get parts from a Hyundai or Mitsubishi dealer. Ditto for Tracer parts at a Mazda agency or Nova parts at a Toyota store. Sprint and Spectrum depend on the futures of Suzuki and Isuzu in America, while LeMans is the "if-fiest" in this regard.

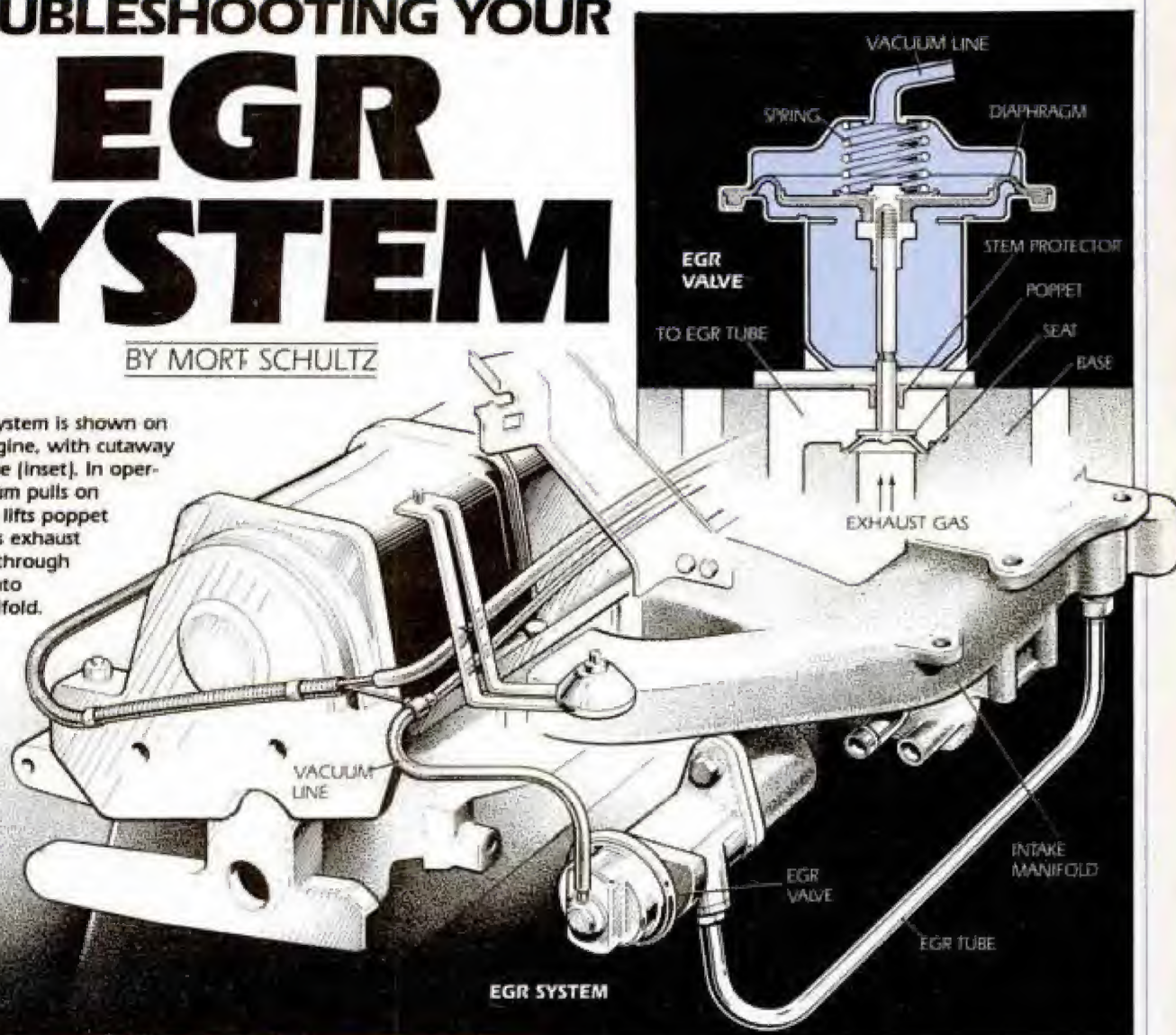
PM

SATURDAY MECHANIC

TROUBLESHOOTING YOUR EGR SYSTEM

BY MORT SCHULTZ

Basic EGR system is shown on Chrysler engine, with cutaway of EGR valve (inset). In operation, vacuum pulls on diaphragm, lifts poppet off seat, lets exhaust gases flow through EGR tube into intake manifold.

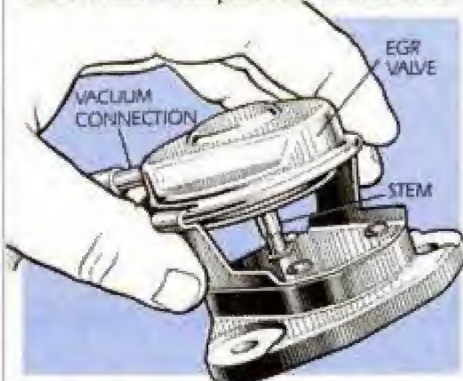


What automotive part has gotten the most bad press in the past 15 years? Taking blame for multitudes of engine problems—including hard starting, stalling, hesitation, surging, spark knock, missing, rough idle, lack of power and backfiring—is the EGR valve. Its purpose is to limit the quantity of oxides of nitrogen (NOx) engines spew into the atmosphere. To keep down NOx levels, it's necessary to keep combustion chamber temperatures below 2500° F by injecting exhaust gas into the intake system. This dilutes the fuel/air mixture, lowering temperatures dramatically. The tricky part is knowing when to inject, because EGR is unnecessary at idle or full throttle. Modern carburetors and fuel injection systems are calibrated with EGR in mind, so a malfunctioning

EGR system (or a missing one) can lead to serious spark knock.

Facts about blame

EGR control components include time-



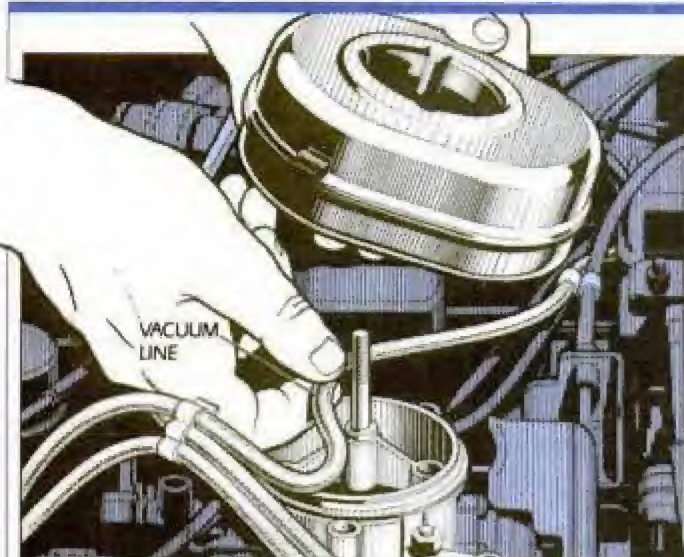
1 Watch stem of EGR valve for movement when diagnosing EGR system problems.

delay valves, coolant or ambient temperature vacuum switches, back-pressure transducers, vacuum-amplifiers, timers, electric-pulse solenoids.

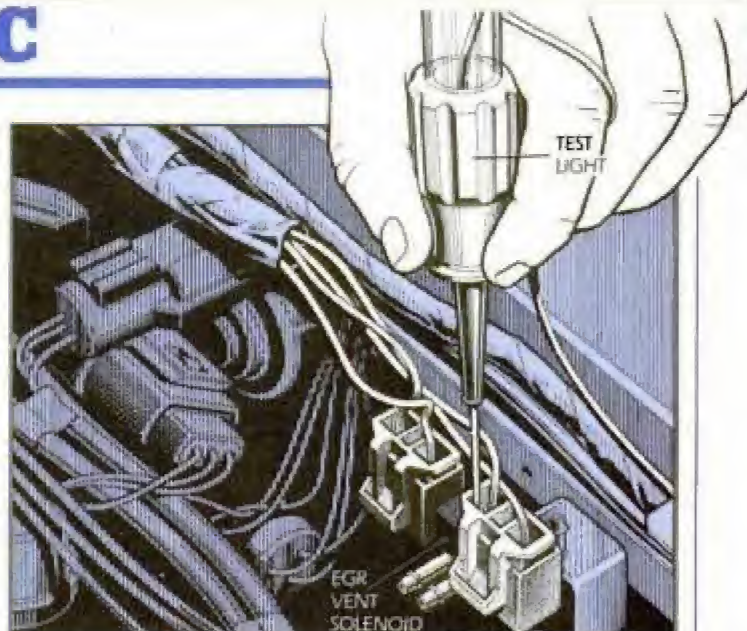
EGR systems rank high on the list of automotive systems misdiagnosed by both Saturday and professional automotive mechanics.

Many believe a system has failed if they feel no movement from the EGR valve diaphragm as engine speed is increased. Under some conditions, feeling no change is normal.

Accurately troubleshooting the EGR system in your vehicle hinges on your knowing how it is supposed to work and which components control the valve. The following is a description of some of the main EGR systems used by Chrysler, Ford and General Motors over the past 10 years.



2 Damaged vacuum lines can disable an EGR system; be on the lookout constantly for kinked or cracked hoses.



3 Use test light to ground EGR vent solenoid; it should click if solenoid has power, is electrically okay.

Chrysler systems

Most Chrysler Corp. cars and light trucks built in the U.S. use one of two types of EGR systems: venturi-vacuum or ported-vacuum. With the venturi-vacuum system, vacuum is drawn from a port tapped into the venturi of the carburetor or throttle body. Because the pull of venturi vacuum by itself is not strong enough to raise the EGR valve diaphragm off its seat, Chrysler uses a vacuum amplifier.

In addition, there's a coolant-controlled temperature valve or timer to prevent the EGR valve from opening when the engine is cold or started, which would cause hesitation or stalling. A charge temperature sensor (CTS) may keep the delay timer from beginning its countdown until the fuel mixture in the intake manifold is above

60° F. The delay timer, controlled by a solenoid, delays the vacuum signal from 35 to 90 seconds.

Troubleshooting Chrysler EGR

Start a *cold* engine and let it run between 2000 and 3000 rpm. Watch the stem of the EGR valve (Fig. 1). It should not move.

Let the engine warm up for 2 or 3 minutes. Increase engine speed to between 2000 and 3000 rpm as you watch the valve stem. It should now move.

If the stem acts this way, the EGR system is working properly. But if the stem doesn't move when it's supposed to, either the EGR valve is bad or vacuum is not reaching the valve.

To test the valve, disconnect the hose from the valve hose connector and attach a hand vacuum pump securely to the connector. Pump up vacuum; then, hold it at a steady reading. If the EGR valve stem still doesn't move, replace the valve. Even if the stem moves, there still may be a slow loss of vacuum because of a pinhole in the diaphragm, so apply vacuum and squeeze the hand vacuum pump hose closed. The valve stem should stay open as long as the hose is clamped. If the stem falls, replace the valve.

If hand-vacuum-pump testing confirms that the EGR valve is in good shape, check the rest of the system. First, examine the entire length of vacuum hose from the EGR valve to wherever the hose ends. Replace or straighten cracked or kinked hoses.

If the vacuum hose ends at a part that screws into the radiator, cylinder head, intake manifold or water pump hous-

ing, you're dealing with a coolant-controlled EGR temperature valve (CCEGR). When the engine is cold the CCEGR vacuum switch should shut off the flow of vacuum to the EGR valve. To test, make sure the engine is fully cold (shut off for at least 12 hours), and the ambient temp in the shop is below 80° F or so. Then connect a hand vacuum pump to the connector nearest the threads and pump up vacuum. There shouldn't be more than a 1-in. drop in vacuum in 1 minute. If it's too warm in the shop, you'll have to remove the switch and immerse it in ice water or put it into the refrigerator.

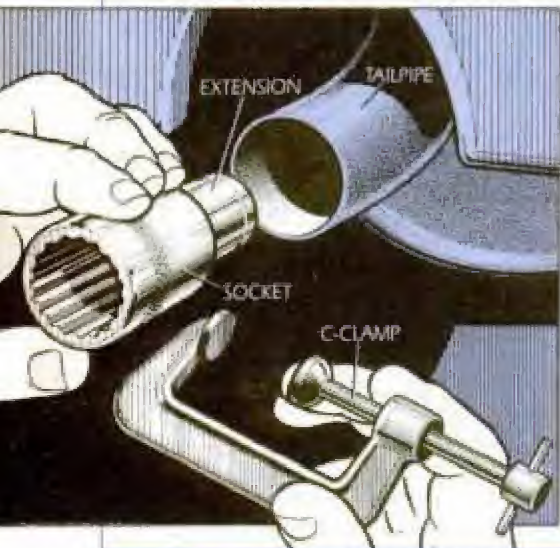
Replace a bad CCEGR with one the same color (and temperature value) as the one your car was originally equipped with.

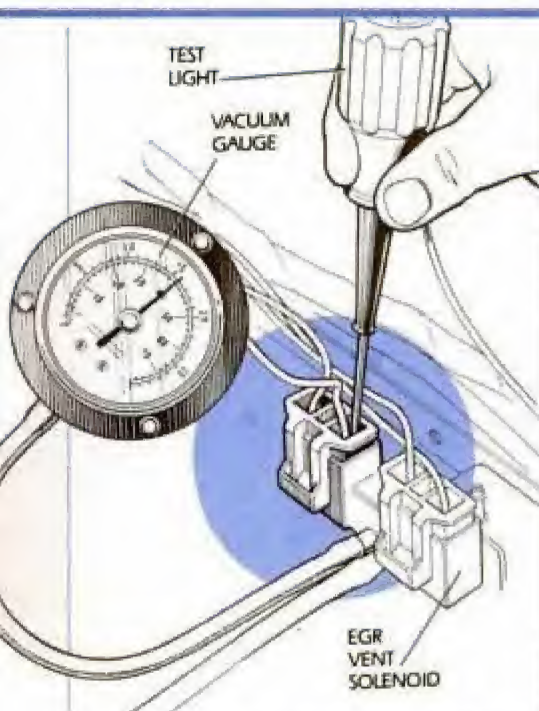
The EGR valve hose may go to a vacuum amplifier. Coming off this circular component are one or two other hoses. If there is one hose, it goes to a solenoid that controls a delay timer. Two hoses go to the timer solenoid and a charge temperature sensor, respectively. The CTS senses the temperature in the intake manifold. Here's how to test these components:

■ **Vacuum Amplifier**—Trace and disconnect the hose going to the CCEGR from the amplifier, or if there's no CCEGR, from the carb or throttle body. Attach a vacuum pump to the hose, and start and warm up the engine. Apply 2 in. of vacuum with the pump. The valve stem should move and the engine should idle roughly. If not, replace the vacuum amplifier.

■ **CTS**—With the engine cold, disconnect the two wires and connect the ohmmeter across the terminals. If the

4 Clamp close-fitting socket with extension into tailpipe to build back-pressure.





5 Vacuum gauge readings should not drop more than an inch during testing.

resistance is 10 ohms or more, replace the CTS.

■ **Delay timer solenoid**—Disconnect the wire going to the timer at the solenoid to uncover a 2-prong connector. Attach a jumper wire from one prong to ground. Attach a jumper wire from the battery and touch it to the other prong. If the solenoid doesn't click, replace it.

■ **Delay timer**—For stalling or rough idle in the first minute of operation, suspect a faulty timer. With the engine cold and turned off, disconnect the vacuum hose at the EGR valve and reat-

tach it at once. Start the engine and rev it up between 2000 and 3000 rpm. Watch the EGR valve stem as you keep time using a watch with a sweep hand. If the timer is black, the stem shouldn't move for 35 seconds; orange, 60 seconds; red, 90 seconds.

Chrysler port-vacuum EGR

A small coolant-temperature-operated switch, called a coolant vacuum switch (CVS), won't admit ported vacuum from a fitting just above the throttle plates to the EGR valve until the engine has warmed up. Troubleshoot these components with a hand vacuum pump the way we've just described for a venturi vacuum system.

Ford systems

Most FoMoCo engines in 1974 and later, U.S.A.-built vehicles without microprocessors have one of three types of EGR systems: ported vacuum, remote back-pressure transducer or integral back-pressure transducer. Trace the vacuum hose from the EGR valve. If it connects to a part having several hoses attached to it, that part is a vacuum switch and you have a remote back-pressure transducer system. Otherwise, you're dealing with a ported vacuum system (3-in. vacuum motor), or an integral back-pressure transducer system (4-in. vacuum motor).

Begin testing a back-pressure transducer system by disconnecting the vacuum hose at the EGR valve. Start the engine and press your thumb over the hose. If the engine is a 2.3 liter, run it at 3000 rpm. If it's a 1.6 liter, run it at 4000. With all other engines, press the

accelerator pedal down once and release it. You should feel vacuum at the hose end. If not, and the hoses are okay, replace the back-pressure transducer, which lies between the EGR valve and the intake manifold.

You still have to test the EGR valve. Reattach vacuum hose and build up exhaust system back-pressure by inserting socket into tailpipe (Fig. 4).

Remove the vacuum hose at the EGR valve and attach a vacuum pump to the valve. With the engine idling, apply 6 in. of vacuum. The EGR valve diaphragm should move, and the engine should start to run roughly. If so, clamp the vacuum line to the pump and hold it for 30 seconds. Not more than 1 in. of vacuum should be lost. If any of these tests fail, replace the EGR valve.

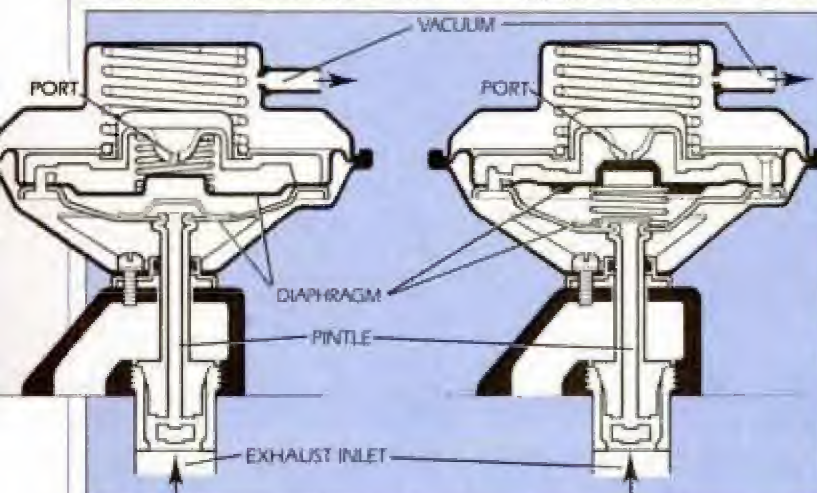
Microprocessor system

Ford-built vehicles with microprocessor control systems have electronically controlled EGR systems. A sensor called the EGR valve position sensor, which is mounted on top of the EGR valve, receives signals from the microprocessor through two solenoids to control the opening and closing of the valve. Let's call one the control solenoid and one the vent solenoid.

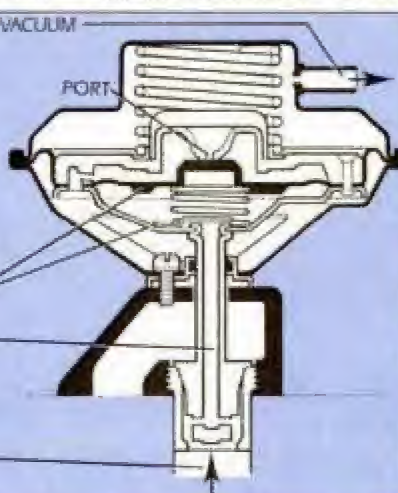
To check this system, first test the EGR valve by disconnecting the vacuum hose connected to the valve and attaching a hand vacuum pump. Apply vacuum and hold it for 30 seconds. If vacuum drops more than 1 in. in that time, replace the valve.

If the valve tests okay, but spark knock persists on the road, test the electrical part of the system. Begin at

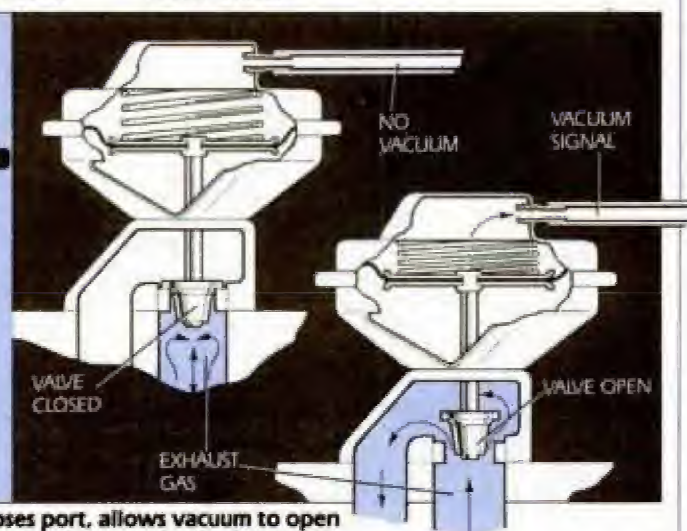
GM POSITIVE BACK-PRESSURE EGR VALVE



GM NEGATIVE BACK-PRESSURE EGR VALVE



GM SINGLE-DIAPHRAGM EGR VALVE



6 In positive-type valve exhaust gas flows through hollow pintle, closes port, allows vacuum to open pintle. In negative, vacuum pulls diaphragm port open, keeps pintle closed unless exhaust pressure keeps it shut. In single-diaphragm type, vacuum opens valve.

the EGR vent solenoid (Fig. 3), which is the solenoid having the small vent. Connect the pigtail end of a test 12-volt light to a convenient ground and turn on the vehicle ignition switch, but don't start the engine.

Probe the electrical connectors at the solenoid with the tip of the test light. If probing both wires with the test light doesn't make the light glow and the solenoid click, replace the solenoid. Test the control solenoid the same way. Now, make sure solenoids hold vacuum.

To test the vacuum-holding ability of the control solenoid, disconnect the vacuum hose from the solenoid and attach a hand vacuum pump. Seal the vent of the vent solenoid with tape or a finger to keep vacuum from escaping.

Pump up vacuum and energize the control solenoid with the test light. If vacuum drops, the control solenoid is bad. Replace it.

Test the vent solenoid by continuing to hold the vent closed and maintaining vacuum on the control solenoid. Energize the vent solenoid with the test light. As you do, unblock the vent. Vacuum should not drop, meaning that the vent solenoid has closed and vacuum is being retained (Fig. 5).

GM systems

Most GM engines with and without Computer Command Control (CCC) have one of three types of EGR valves: single diaphragm (or port), positive back-pressure, or negative back-pressure (see Fig. 6).

Warm up the engine. With a 6- or 8-cylinder engine running at 2000 rpm or a 4-cylinder engine running at 3000 rpm, pull the vacuum hose off the EGR valve and place your finger tightly over the end of the hose.

If you don't feel vacuum, there's a bad hose or a defective vacuum component. If vacuum is present, reconnect the hose, reach beneath the valve and put your finger on the diaphragm. It will be either rubber or metal.

If rubber, you're dealing with a single-diaphragm EGR valve which opens and closes in response to ported vacuum. Test this valve by alternately opening and closing the throttle. If the diaphragm moves up and down (if it doesn't, replace it), attach a hand vacuum pump and apply vacuum (Fig. 7). If vacuum doesn't hold, replace the valve.

Positive back-pressure EGR valves are controlled by both vacuum and exhaust back-pressure. Test it with the engine warmed up and running at a fast idle. Disconnect the vacuum hose from the valve, insert a golf tee in the end of the hose and place a finger on the valve diaphragm. The diaphragm should stay down and engine speed should increase. Reconnect the vacuum hose and feel if the diaphragm rises. Engine speed should decrease.

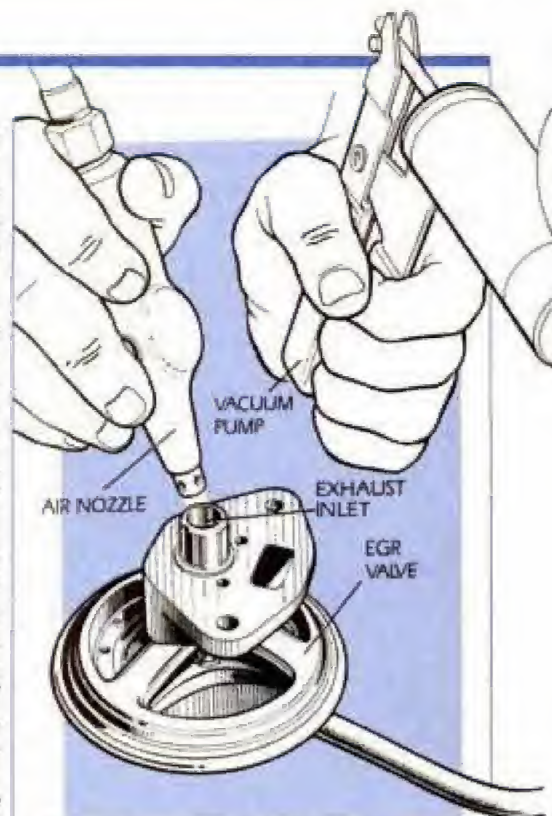
Note: You may feel a slight vibration from the diaphragm plates of both positive and negative back-pressure EGR valves. This is normal. Take the valve off the engine. Apply 10 in. or more of vacuum to the valve with a hand vacuum pump. The diaphragm should not rise off its seat.

Maintaining vacuum, aim a stream of low-pressure air into the valve's exhaust outlet (Fig. 8). If the diaphragm doesn't open completely, clean the exhaust passage if it's heavily coked, or replace the valve.

A negative back-pressure EGR valve is controlled by a combination of manifold vacuum, ported vacuum and negative exhaust back-pressure. Test it with the engine off.

Disconnect the vacuum hose from the EGR valve and push up on the diaphragm plate as you place a finger tightly against the EGR valve hose connection. If the diaphragm drops in less than 20 seconds, replace the valve. Repeat the procedure as some-

7 Apply vacuum to EGR valve, watch stem move up. Diaphragm should then hold vacuum steady, not leak down.



8 Back-pressure EGR should open when compressed air is blown in exhaust inlet.

one cranks the engine. If the diaphragm doesn't drop, replace the valve.

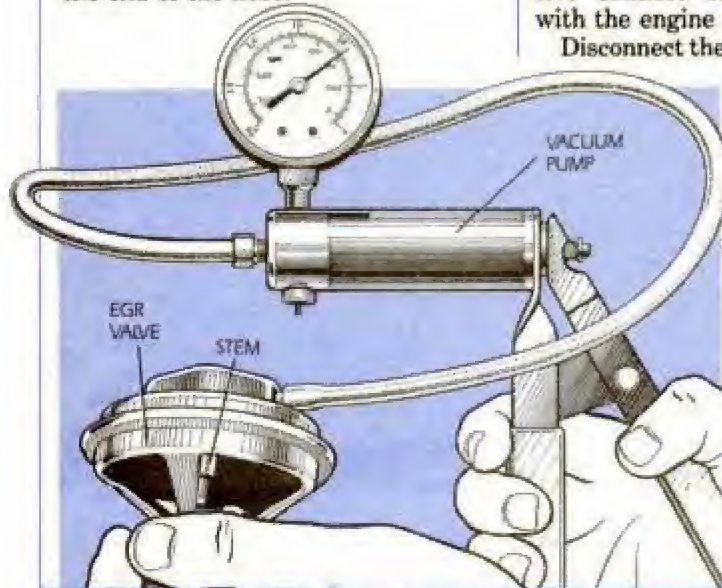
GM EGR control units

Most GM engines use a thermal device that controls vacuum to the EGR valve. Engines without CCC employ a coolant-temperature-sensing switch, an engine-heat-sensing or a combination coolant and engine switch.

If the EGR valve responds positively to tests, make sure the rest of the system is not causing your engine problem by checking hoses; then, by replacing the control switch.

The EGR control system of GM engines with CCC on pre-1983 and many post-1983 vehicles consists of a solenoid and a thermal sensor. To test them, connect a vacuum gauge to the end of the hose at the EGR valve and start the engine. Open and close the throttle a few times. There should not be a vacuum reading until the engine gets warm.

If there is a reading, remove the wire at the solenoid. If this makes vacuum disappear, replace the thermal sensor. If the vacuum reading persists, suspect a bad solenoid. Beginning in 1983, GM started using a Pulse-Width-Modulated EGR System that pulsates up to 32 times per second on 2.8-, 3.0-, 3.8-, 5.0- and 5.7-liter engines. If you find that an engine-driveability problem is not due to a bad EGR valve, get help to determine if it's one of the control units. **FM**



'HOW I BOMBED QADDAFI'

(Continued from page 114)

three or four orbits to let him try to catch up. At that point, I decided to do a little torching. The F-111F fuel dump is located between the two engine outlets. What you do is dump a little fuel and, at the same time, light the afterburner. It's like igniting the contents of an aerosol can with a lighter. But with an F-111F, the results are spectacular! Our tardy F-111F saw the flame and made the rejoin with no problem.

All the way down there, the anticipation of finding the targets, executing the attack, the risks, the uncertainties, kept the adrenalin up to where I was pretty alert. But when I came back and rejoined with the tanker, I noticed that when I refueled, I didn't do as good a job as I should have. The flight surgeon had given us all a couple of go pills, or amphetamines, if we started to get tired. So I took one with a swig of water and felt bulletproof again.

Heading for Lakenheath

On the long flight back, I knew we'd lost an airplane because he hadn't made his "feet wet" call and was nowhere around. So I sat there in my airplane, flying back, listening to the high-frequency radio. We were able to tune in the press conference back in Washington announcing the strike. We heard Secretary Weinberger describe the mission and say that we had an overdue airplane. The press asked if the plane had been shot down and the secretary said: "It's unknown at this time. He could be having a radio problem, or could have been diverted to another airfield." And that was all true, because, really, at that point he didn't know for sure.

But, as we flew back up the Atlantic toward Lakenheath, I knew.

I guess the only noteworthy thing that happened on the long flight back was making the decision to send one malfunctioning F-111F into Spain. A bleed duct in one engine's compressor system failed—a relatively minor problem—but we decided to risk the political considerations in sending the plane to Spain rather than risk losing an airplane 10 miles out of Lakenheath.

Emotions were mixed but I was feeling pretty low as we headed home. I figured we'd hit the target pretty good, but you always hate to lose an airplane. Our mother tankers refueled us enough to get back with a reserve and we pulled in just as the sun was coming up.

It was funny. We had left when the sun was setting the night before and now it was sunrise. Another day.

But it had been a night that will last a long, long time for those of us who had been a part of it.

How many undeserved radar tickets were issued last year?

- a) 1,012,317
- b) 649,119
- c) 0
- d) No one knows

Unfortunately, the correct answer is d) No one knows. Over 10,000,000 tickets were issued last year. By some estimates, up to 30 percent of them were incorrect.

Traffic authorities like to say that radar is as accurate as a yardstick. And that's the problem. You know how two people can get different answers using the same yardstick. Even if only 1 percent of the tickets issued last year were the result of radar errors, that's still 100,000 undeserved tickets.

Our credentials

Our engineers are radar experts. They had to know every detail about traffic radar before they could design ESCORT and PASSPORT, the most respected names in radar detection and warning. Road & Track called us, "The industry leader in detector technology."

The Free Report

Now these engineers have released their new report: "How Radar Works." It explains the capability—and the limits—of radar in plain language. And it's free. Just call us toll-free or mail the coupon.

FREE REPORT ON RADAR

YES, I want to know how radar works, and how it makes me vulnerable. Please send your free engineering report right away.

Name _____

Address _____

City, State, Zip _____

Cincinnati Microwave
Department 96877
One Microwave Plaza
Cincinnati, Ohio 45209-9502

TOLL FREE 800-543-1608

One-Step RACE GLAZE™ beats wax to the finish!

Unique formula outcleans, outshines & outlasts wax!

■ Used by leading auto makers and dealers, Race Glaze Polish & Sealant is a unique chemical formula that's been proven to clean, shine and protect much better than wax. Race Glaze will restore original showroom beauty to an average car in just 30 minutes!



Beats Wax in Beauty & Durability.

Unlike wax, Race Glaze won't yellow. Rain won't wash it away. Race Glaze flows on smoothly and wipes off easily to a tough, long-lasting high-gloss finish every time.

An Amazing Deep Cleaner.

Simple-to-use Race Glaze quickly lifts dull paint, cuts deep dirt, heavy road grime, sticky tree sap, gas stains and tar—and even cleans glass to prevent fogging.

A Micro-Fine Polish.

Special Race Glaze polishing agents, made up of an ultra-fine jeweler's rouge, gently remove scratches and swirl marks without damaging the finish. Race Glaze is so safe it can be used on paint striping, tape decals and gold leaf lettering.

A Long-Lasting, "Liquid-Look" Poly Sealant.

Race Glaze's micro-thin polyethylene polymer film coating bonds fast to any finish to form a tight, smooth, crystal-clear protective seal. Its rich, liquid brilliance resists salt spray, sun fading, acid rain and other hazards 3 to 4 times longer than wax or resin products. And extra coats simply add to the deep luster and durable beauty.

Over Twice The Coverage At A Fraction Of The Cost.

Gallon for gallon, Race Glaze covers more than twice the surface area of ordinary wax and resin products. Since it protects longer, too, it's the most economical combination cleaner, polish and sealant you can buy. Try Race Glaze once—and you'll be through with waxing for good!

RML
corporation

P.O. Box 2109
Waukesha, Wisconsin 53187-2109

Race Glaze

16-oz. bottle

\$12.00 ea.

3 or more bottles

\$10.95 ea.

Add \$2.50 per order for

shipping and handling.

No. of bottles desired _____

Payment Method

☐ Check or Money Order
(Payable to RML Corporation)

☐ MasterCard ☐ VISA

MasterCard or VISA Number _____

(Please print clearly)

Signature _____

Expiration Date _____

Order By Phone—

Call Toll-Free

1 800-542-2750

In Wis. 1 800-521-6110

MUSCLE BOATS

(Continued from page 105)

es in the cuddy are a prime example. The powerlift motor hatch, with inside viewing mirror, is also well-built.

Maxima Stereo pipes high-energy sound throughout the boat. The tilt wheel adjusts to fit all drivers, and the cockpit floor has a rough-sand finish fiberglass to prevent slipping. Naugahyde upholstery is well sculpted throughout the cockpit, while the cuddy cabin is finished in a soft velour.

Thunderbird Formula F206 LS

The F206 LS was the quickest of the fleet out of the hole, which should make it a favorite with skiers. It didn't match up on top-end speed or on the performance course, so, despite good marks in other areas, we ranked it No. 3.

One of the best features on the boat is

the "Silent Thunder" exhaust system, which routes noise and fumes through the swim platform. This silences the roar of the big V8 to a distant grumble. Seating is comfortable, and the upholstery is exceptionally well executed. Deep buckets hold securely in turns.

Gauge visibility is excellent and the small, padded wheel is just right for the performance driver. However, we found a bit too much play in the steering. Visibility through curved windshield is excellent.

The cabin entry is eased via a cut-away in the dash, allowing a bit of headroom. The sleeping pads are exceptionally thick and comfortable, and the Blaupunkt stereo is awesome.

Donzi Z-21

The Donzi scored high in hull construction and rough-water performance, and finished a close third in top end. But fourth place finishes in acceleration and

in the performance course, combined with an interior that wasn't quite on par with others in the test fleet, led to a fourth-place ranking.

Donzi reveals its offshore heritage when you take a look at the massive engine mounts and stringer system, a solid structure that made it one of the heavier boats and probably accounted for somewhat slower acceleration.

This extra weight is a plus when running offshore, however. Combined with its sharp, 22.5° vee hull, the Donzi cut waves like a giant sword, with no tendency to hammer even at 40 mph.

Steering wheel placement was disappointing, though, set so low that an average-height driver will have to crouch to grip it—an impossible position for long runs.

In a distinctive design feature, the exhausts exit on the sides of the boat, just ahead of the transom. If you like noise, you'll love this system. If you don't, you'll hate it. Another unusual aspect of the boat is the nearly complete absence of storage space.

Like Sea Ray, Donzi will not give out complete details of its hull construction. The boat builder admits to using a combination of Tri-Axial fiberglass fabrics with lightweight Coremat between layers to smooth out the surface. The result is an exceptionally sleek appearance, which ultimately becomes the Z-21's primary strong suit.

Chaparral Villain III

The Villain awed the test crew with its wave-hopping capability, slamming through a tough inlet just as smoothly as it ran the flat waters of a protected waterway. However, it was not the fleetest of the fleet and corners cut to keep costs down (it is several thousand dollars below the other boats tested) were evident enough for us to rate the Chaparral No. 5.

We liked the exceptional stability at top speed—almost like driving a car. Upholstery was plush and well coordinated with boat trim. But when we managed to slip into the cuddy through the tiny entryway under the dash, we found no ventilation and the mattress pad too thin for comfort.

The sweptback windshield looks good, but the grab rail above it cuts across the line of sight for most drivers. The oversized, padded wheel is ideal for sporty driving, but obstructs the tach and speedometer. Also, the seats seemed rather rickety in their mounts for performance boating.

Unlike some of the other PM comparison tests, our clutch of speed machines were remarkably close in style and temperament. That's easy to understand when you consider what they have in common—speed and sex appeal. What else is there?

PM

POINT . . . COUNTERPOINT



The Four Winns Liberator offers comfort at speed.

The Four Winns Liberator and Chris-Craft Stinger 222 are two superb specimens in the muscle boat family. But, as sometimes happens in a strict comparison test, they didn't quite fit our predetermined mold.

The 350 Magnum-equipped Liberator turned in respectable but distinctly lackluster top-end and acceleration times. And she was definitely off the pace during the hard twists and turns of our performance course evaluation. This was because she's a little beamier, has a little more padding in critical areas, and, as a result, travels a little slower than her muscle boat contemporaries. But, these mild performance deficiencies only serve to point up her strong side, a counterbalancing priority placed on superior appointments—like a huge, well-ventilated cuddy cabin forward,

accessed via one of the few reasonable companionway hatches in our 7-boat fleet. The Liberator also makes liberal use of teak trim and fairly oozes stowage space.

More than any other muscle boat tested, the Stinger 222 is directly devolved from the racing fraternity. Its adjustable bolster bench and skimpy cockpit are definitely competition features. Sunpads and other topside amenities are an afterthought here (although the cabin volume and ventilation are superb), and the boat comes with only two engine options—the 260 or the 454. We invited Chris-Craft to send along a 222 with the larger powerplant and enjoyed the vicarious race-boat thrill it offered from the centerline command station. If you want to make a statement, here's a boat that will give it a little sting.—Tim Cole



A racing heritage dominates the Stinger 222—a megamuscle boat from Murray Chris-Craft.

DIGITAL AUDIO CASSETTES

(Continued from page 109)

it's okay for the input signal to reach the 0-dB level—and even beyond for brief periods. The red-colored zone beyond 0-dB indicates that you're saturating the tape and warns of distortion.

When the input level meters of a DAT deck flash red, it's not a warning: It's a fact.

Analog distortion results when the tape simply can't absorb any more signal. A saturated tape will sound muddy. The high, treble frequencies disappear and the bass becomes boomy rather than punchy.

This distortion, however, is created by music. The natural balance of frequencies present in the original has been altered, but the distorted balance remains music (some rock musicians intentionally saturate their recordings to achieve a warm, buzzy sound).

Digital distortion is another thing entirely. Created by the machine, it sounds terrifyingly otherworldly.

Mixed-up bits

Tape saturation from too high an input level plays no part in digital distortion—which sets in when the input level meter hits 0-dB.

Instead, distortion is caused by the inability of the 16-bit digital quantization system to assign a 16-digit code to the too-high input signal. The system has simply run out of bits, and it frantically attempts to assign some code to the overload signal. The scrambled-up bits it assembles, when played back, produce a noise that's horrid and distinctly unmusical. If you can imagine the edgy, broken-up sound of a phonograph needle dragged across a record, that's pretty close to mayhem digital distortion engenders.

To make good DAT recordings—and we did—you must find the optimum input level below the 0-dB "brick wall." That takes trial and error and is made difficult by the wide dynamic range of CDs. Just when you think you've found the correct input level, a powerful passage of music jumps out, hits the brick wall, and crashes your recording.

It helps a bit to know the musical selection you're dubbing. This way, you can test-record the hot spots to find the input-level limits. If you don't know the music, today's DAT decks don't make your job very easy. Unlike 3-head analog cassette decks, there is no way to audibly monitor the recording as you make it. All you can do is watch the input-level meters in order to catch a mistake, correct your levels and re-record immediately. If you don't set the levels correctly and don't watch the meters, you won't be aware of any distortion until you play it back.

Sound quality

For our listening tests we made the best-possible DAT copies from a variety of compact discs, then compared the two side-by-side. After multiple listenings spread over several days, CD emerged as our preference.

The best DAT dubs were very good and, note for note, dead accurate. But they were not sonically authentic. Missing was the transparent or airy quality associated with CD. Humpty-Dumpty had been put together again digitally by DAT, but with a different glue.

The DAT copies did sound better than analog copies of the same material—and would be very satisfying if not compared directly to the original CDs.

But for that matter, so would the analog dubs!

It is for this reason that we feel DAT should not be treated as a special threat to the music industry.

Unfortunately, no record company has released any prerecorded DAT music cassettes, so we can't report on their quality. Theoretically, they should sound equally as good as the CD version. One other thing we couldn't test was compatibility among DAT decks of different brands. Theoretically, a tape made in one deck should play fine in any other. We did test record LP records. Their limited dynamic range (compared to CDs) made them easier to record and the dubs sounded great—though no better than the originals.

For the record, our test system was balanced so that no source would sound louder (and trick the ear into hearing better) than another.

Conclusion

Despite some limitations in these first machines, DAT holds great promise for the future. In an optional recording mode, it can offer four hours of recording time with quality equal to FM stereo. In yet two other optional modes, it can yield either two hours of 4-channel surround sound or two hours of satellite-transmitted digital audio, respectively. Some engineers believe the R-DAT format can even accommodate full-motion video with soundtrack.

We find it sad that the R-DAT format has already been hobbled by the inability to accept or transmit a direct digital signal. The reason? All-digital preamplifiers already exist, and digital amplifiers are in the works. This means an audio signal could be transmitted in pristine digital form all the way from the source unit to the loudspeaker leads without any loss of fidelity. DAT, because it requires analog input and output, now stands to be the stumbling block in this system. Unless future DAT decks sprout digital inputs and outputs, we have in a sense been robbed of the future.

SALE



From
The Leader
Of The Pack...
KLOCKIT

Our prices beat them all! You get: 6 Quartz Clock Movements, Hour & Min. Hands, Hardware plus FREE Clockmaking Ideas Pamphlet and Color Catalog.

6 FOR \$19.95 Plus \$2 Shpg.

Make clocks for Extra Income!

Offer Good Until August 1, 1987

Name _____
Address _____
City State Zip _____
Credit Card No. _____ Exp. Date _____
KLOCKIT DEPT. PM77
P.O. Box 542
LAKE GENEVA, WI 53147
1-800-KLOCKIT (556-2548)
Sorry, no foreign orders.

**MEN
PAST 40**

Troubled With Getting Up Nights
Pains In Back, Hips, Legs
Nervousness, Tiredness

If you are disturbed by these symptoms, your troubles may be caused by glandular inflammation of your prostate. Methods that merely give temporary relief for this condition cannot be expected to remove the cause of your trouble.

The Excelsior Institute Clinic, devoted to the **NON-SURGICAL** methods of treatment for diseases peculiar to older men, has a new **FREE BOOK** that tells how these troubles may be corrected. The **NON-SURGICAL** treatments described in this book require no surgery, hospitalization or long period of convalescence. Treatments take but a short time and the cost is reasonable.

Write today. This book may prove of utmost importance to you. No obligation.

Excelsior Institute Clinic, Dept. 128B
110 E. Broadway, Excelsior Springs, Mo. 64024

ALL NEW! The Homebuilt
JET HELICOPTER
LOW • COST DESIGN — SIMPLIFIED ASSEMBLY
• Uses low-cost fuel • No license needed
Ergonomically designed
CONSTRUCTION MANUAL
Fully illustrated. Only \$11.95*

THE Helicopter Experimenter's
HANDBOOK
• photos • designs • data

NEW: An exciting Kit Helicopter!
Details sent with book orders.

Photoaccessory info:
\$1 or free with your order

HELICRAFT P.O. Box 50
Riderwood, MD 21139

24 Hr. TOLL-FREE Quick Order Line 1-800-338-0332
(Book Orders Only — by Credit Card) In Maryland 1301581-6365

SUN-SHIELD-VISOR
Pliable, durable see-thru vinyl.
Stainless-Steel holds to windshield in cars, trucks, RV's. Reduces glare for sensitive eyes.
4" x 64" - \$5.99 + \$1.50 ship
6" x 64" - \$8.99 + \$1.50 ship
12" x 64" - \$16.99 + \$1.50 ship
WA State res. add .07% tax
Dealers Inquire
TRAVEL 'n SHADE 4229 1st N.W., Dept. PM7/Seattle WA 98107

Miami Vice: Where Cool Becomes Hot

Historians, social scientists and media mavens like to label time and space, give it a tag that focuses on the way we think or the way we act during a given era. The swing generation of the '40s gave way to '50s beatniks and '60s hippies, who espoused peace and poetry. From the me-oriented '70s emerged yuppies and dinks (dual income, no kids), who drank Perrier and breezily discussed commodities futures and the flat tax. Now that we've progressed beyond 1984 and a new century looms, the culture of cool has possessed America, displacing, but not quite eliminating, the self-interest of the previous decade. No other event has done more to shape the trends and attitudes of our time than a TV phenom called "Miami Vice." So let's get cosmic. Whatever way you slice it, producer Michael Mann and actors Don Johnson and Philip Michael Thomas have actually helped define us as a nation.

A sense of social responsibility and high ideals permeates the "Miami Vice" plot lines—regardless of how you perceive the show's dramatic qualities. Sonny Crockett and Rico Tubbs are definitely not in it for themselves as they march on the point against the single most divisive evil of our age—illegal drugs—and other assorted threats to society. They are protagonists with a conscience, making sacrifices and exposing themselves to danger in the sordid, sinister environment of petty and organized crime. They each have overriding sensitivities to minorities, to women. Highly principled, they take very little guff. But they reserve enormous respect for authority, for their colleagues ("call for backup!") and for each other. Gone are the Eastwoodesque forays into the unknown by the lone stalwart. On "Vice," you're in it together—something to consider for self-indulgent baby boomers. Off the screen, both Don Johnson and Philip Michael Thomas are devoted to their privacy and their children—positive attributes indeed at a point in our history when energies devoted to working and socializing have eroded family time.

But—and this is the interesting part—actors Don Johnson and Philip Michael Thomas show us how to conduct a crusade with style. Hence the flashy automobiles and laid-back clothing, the winsome visage behind the stubble beard, the flashing don't-miss-a-trick eyes behind the horn-rim



Don Johnson and Philip Michael Thomas—wearing the white hats.

shades. Cool used to mean duck tails and jalopies, Nehru jackets and neck medallions. Now, nothing less than a Ferrari Testarossa will do, with a bold yet supremely understated tactile look that fairly screams cool. We used to get cool in bursts, in oddly random snatches. But now, cool has got to ooze and envelop. Or it isn't cool.

Combine the dramatic tension of a war against the depravities of crime with the visual statements wrought by automobiles, yachts, an occasional fixed-wing aircraft or helo. You're left with an entertainment experience that speaks volumes, even though the actual dialogue is Spartan and restrained. The essence of acting is nonverbal—actions, glances, movements that convey messages. And saying a lot when you're actually speaking very little makes for the best performances. Intimacy between the actor and the viewer is the objective, and whatever you have to say about the writing on "Miami Vice," it is a testament to the acting abilities of Johnson and Thomas that they can communicate by simply standing in one spot and being, well, cool.

And so, from the show that brought us cool, we have a whole new style of dress. It's now okay for men to have some stubble on their chin, and sales of sunglasses have certainly increased since the show went on the air. More importantly, we have a heightened awareness of the harm of illegal drugs. All of this, of course, is pretty cool. And we could argue that it began with the creative forces who brought you a new kind of television show on Friday nights.—*Tim Cole*

MIAMI VICE CARS

(Continued from page 89)

pinned inside the cockpit. The wheel is a popular item among the street-rodding set, who remove the wheel to prevent their cars from being stolen.

Since the car would be used interchangeably with the real Testarossa during filming, they had to be as identical as possible. One discrepancy that caught Roberts' eye was that the Ferrari sat lower to the ground. The seats in the Pantera were up too high. The situation was easily rectified by cutting out the Pantera's floor pans and dropping the seats. The Ferrari was also wider than the Pantera. While the Pantera's body panels could be blown out to the required width, the rear tires didn't sit out far enough inside the wheel wells. The solution here came in the form of a set of custom Sbarbaro wheels. The rear wheels were offset 6 in. and were built with a 12-in. width. The Pantera rim is only 8 in. across.

Power for the stunt car comes from a 351-cu.-in. Ford Cleveland engine that runs a Predator carburetor from PCI, Inc., to minimize fuel lag and poor throttle response when the car comes out of a slide.

Foam was added to the carburetor float bowl to keep the fuel from sloshing around during stunt maneuvers and high-speed chase scenes.

While the stock engine is good for about 300 hp, Roberts wanted more power for that extra margin during stunts. He decided against going the supercharger or turbocharger route because of the expense and the room the system would have taken up in the engine compartment. Since power-boost requirements were needed for 10- to 15-second bursts, a nitrous oxide system was installed. A shot of the gas gives an instant 100-plus hp, enough to handle any situation.

But just in case it's not enough to handle any situation, Roberts is getting set to install a 420-cu.-in. Ford Cleveland engine that's available through Ford's motorsports program. The mill is good for 450 hp at 5000 rpm with 350 ft.-lbs. of torque at 2000 rpm. A nitrous system should add an additional 100 to 150 hp in the tight spots.

Backing up the Ford powerplant is a ZF 5-speed transmission. A special braking system uses a second brake pedal to activate the rear brakes only. Locking the rear brakes helps the car spin out or spin around in the classic bootleg U-turn.

It all promises to be an exciting season this fall for the cars of "Miami Vice." Now all it takes is for the producer and writers to bring the rest of the show up to the interest level generated by the machinery. **PM**

**Now you can
have Lifetime
Security in a
CASH business
where you can
easily make up
to \$200.00 per
day and more**

Find out how ...

... send NOW for your

FREE Lifetime Security Fact Kit

Your FREE Lifetime Security Fact Kit tells you how to make \$18.00 to \$30.00 an hour in your own Foley-Belsaw Full-Service Saw and Tool Sharpening Business. Your FREE Fact Kit explains how you can:

- be your own BOSS!
- work full time or part time, right at home.
- do work you enjoy and take pride in.
- operate a CASH business where 90¢ of every dollar you take in is clear cash profit.

And it is *so easy* to learn. Foley-Belsaw gives you all the facts and instructions. No previous experience or special training is necessary. All you need is the desire and ambition to be your own boss. Foley-Belsaw tells you everything you need to know to be successful.

There's plenty of business where you live to keep you busy. It doesn't matter whether you live in a big city, small town or a small farm community.

You'll quickly be able to develop the skills necessary to earn a steady income. You'll be able to sharpen all types of saws, garden and shop tools for home, farm and industry.

Profits from your Foley-Belsaw Full-Service Sharpening Business can provide...

- ... CASH for future security or supplemental income
- ... CASH for travel, vacations, fishing trips
- ... CASH for the things you've always wanted!

And you'll be able to set your own hours and not



have to worry about layoffs and strikes. There are no franchise fees. Best of all—age or physical condition is no barrier—any age person can succeed.

You can be like Steve Taylor of Brookville, Ohio, who told us:

"... the first year I grossed \$21,000.00."

Or James B. Jones, of Albuquerque, NM who reported:

"This past summer my sales and service amounted to almost \$6,000.00 a month."

But you've got to get the FACTS before you can get started. So **WRITE NOW** for your FREE Lifetime Security Fact Kit. It's yours to keep with **NO OBLIGATION**.

The Foley-Belsaw Company
6301 Equitable Rd., Dept. 20495
Kansas City, Mo. 64120



**FREE
LIFETIME
SECURITY
FACT KIT**



Foley-Belsaw Co.
6301 Equitable Rd., Dept. 20495
Kansas City, Mo. 64120

- ☐ **YES**, I want to know more! Please rush my FREE Lifetime Security Fact Kit. No obligation

Name _____

Address _____

City _____

State _____

Zip _____

(Area Code) Phone _____



PORTABLE CABIN PLANS

UNIQUE DESIGN...GOES UP IN LESS THAN 1 HOUR!

- uses no fasteners
- variable size to fit your needs (10' x 10' sleeps 8, etc.)
- many uses
- build it yourself with locally available materials

Complete blueprints and easy-to-follow instructions
ONLY \$9.95 plus \$1.50 postage & handling

Call TOLL-FREE 24 hours a day, 7 days a week
 1-800-521-0334 ext 910 (in MI 1-800-482-4242 ext 910)

WEL-BA CO.
 Dept. 102
 2850 Timpone Rd., Lowell, MI 48331

Money-back guarantee

BASEMENT TOILET

FLUSHES UP To Sewer or Sump Pump

No Digging Up Floors
 Install It Yourself - Anywhere

Write McPherson, Inc., Dept. 16
 Box 15133 Tampa, Florida 33684



LOOKSOUND

High-Quality lens with supersensitive IC Micro FM Radio
\$39.95 - \$3.00 S/H
 VISA/Mastercard

Cameo Enterprises, Inc. P.O. Box 63, Accord, MA 02018
 INFO (617) 843-1900 - 1-800-522-2636 (For Orders Only)




MUSCLES

HOW TO BUILD A MORE POWERFUL BODY!

FREE BROOKLYN

See Muscle Pumping Methods grow you wider shoulders • Trimmer waist • Powerful chest • Bigger arms • Gain weight and strength. Write today!

UNIVERSAL BODYBUILDING
 Dept. 04, BOX 8894, DETROIT, MI 48240



START YOUR OWN PROFITABLE BUSINESS...

at home, with this proven money making book! Hundreds have already made thousands of dollars, so don't wait! Order Today! Only \$20.00! 10 day money-back guarantee! Simply send cash, check or money order, with your name and address to:

ENTERPRISE BOOKS
 Dept. PM787, P.O. Box 5419
 Pawtucket, RI 02862


NEW!

COMBINATION WATCH/LIGHTER

- Gas Refillable!
- Generous, Exquisite & Super Thin Type With High Quality Products.
- Smart Fashion Design for Men & Women.

Send Check/M.O. for \$19.95 + \$2.50 P+H to:

La-Draw Novelties
 P.O. Box 20233X Columbus Circle • New York, NY 10023



SOLVE YOUR MESSY STORAGE PROBLEMS

Make efficient use of air space with suspended rafter shelving. Made of 14 gauge steel. Hangs on standard stud centers. Full one year warranty. Prompt delivery.



Style	W	H	L	Price
16" Centers	14 1/2"	25 1/2"	36"	\$49.75
18" Centers	16 1/2"	25 1/2"	36"	\$51.75
24" Centers	22 1/2"	25 1/2"	36"	\$53.75

Send check or money order plus \$3.50 per item, shipping & handling to:
Milwaukee Steel Fabricating, Inc.
 1624 S. West Ave., Waukegan, WI 53186
 Attn: Dept. SGS PM
 *Wisconsin Resident include 5% Sales Tax.
 Sorry No C.O.D.'s


Radio Shack Tandy

Our 10th year of DISCOUNTS
 COMPUTERS & CELLULAR PHONES
 Fgt. Prepaid. Save Tax—Toll Free 800-231-3680

MARYMAC INDUSTRIES INC.
 22511 Katy Fwy., Katy (Houston) TX 77450
 1-713-392-0747 Telex: 774132

At Last a New Amazingly Simple GAS TURBINE JET ENGINE

Build from easy to follow plans. Length 15", Dia. 5 1/2", Wt. 12 lbs. Fuel: Gasoline or Kero.
 "Screaming Demon" develops 30 H.P. Ideal project for serious-minded hobbyists, students, scientific and industrial arts classes. Make on 8" metal cutting lathe with milling attachment. For use on small racing boats, midjet cars, etc. Full size assembly drawings with critical dimensions, bill of materials and photos. Price \$10.00 Mo. C.O.D.
SAVOY SCIENTIFIC 1510 26th St., P.O. Box 1788 SANTA MONICA, CALIF. 90408



REPLICA MODELS

HISTORIC NON-FIRING MODEL GUNS...

Sale! Full size. Zinc alloy. Realistic. Over 30 parts. Cannot chamber or fire real ammo. Assembled. FREE Catalog.

COLLECTOR'S ARMOURY Credit Card Orders: (800) 636-2000
 Box 54, Dept. PM Alexandria, VA 22313 Toll Free 24 Hrs.

U.S. M1911 45 AUTO \$79.95
 Length: 13" Weight: 41 oz




Portable Steam Cleaner

Steam in 60 seconds

CLEAN:
 Engines, Air Filters, Lawn Mowers. 3-yr. guarantee on fire box, coils. Uses liquid soap, propane fired. Wt. 120 lbs. Auxil. pump required on low water pressure.

WEDCO MFG. INC., Dept. M-18
 P.O. Box D, 940 West Broadway, Jackson, Wyoming 83001



Pay For Your Hobby!

With White's NEW Series 3 Metal Detectors

Sensitive detectors locate the rare and valuable for fun and profit. \$99.95 & up!

Call Toll Free: 1-800-547-6911

WHITE'S ELECTRONICS
 Dept. PA-6 Sweet Home, OR 97386



Popular Mechanics

How-To Books

The Guide to Self-Sufficiency

Guide to Self-Sufficiency Learn to be totally self-sufficient. Find and prepare your own food, raise farm animals, brew beer, thatch a roof, create

your own electricity, tan a hide and much more. Over 600 two-color illustrations and step-by-step instructions show you how. (BA-1912—\$10.00)

TO ORDER: Send your name and address with check or money order to **Popular Mechanics**, Box 1014, Radio City Station, New York, NY 10101. Please specify the proper "BA" number.

Popular Mechanics is a publication of Hearst Magazines, a Division of the Hearst Corporation.
 © 1986 The Hearst Corporation. All rights reserved.

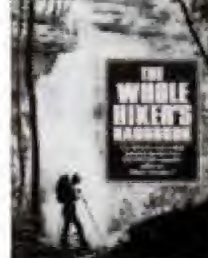


Auto Repair Manual '81-'87 A valuable reference for the do-it-yourselfer. Covers more than 1,900 domestic models, with over 55,000 essential service specs and repair facts and 2,500 diagrams, cutaways and quick-check spec charts.

Updated sections on fuel and ignition systems for at-home repair. (BA-1914—\$21.50)

Whole Hiker's Handbook

Everything you need to know about hiking and backpacking. 150 topics including proper equipment, hiking alone, avoiding lightning and backpacking in grizzly bear country. Plus you'll read about on-the-trail experiences, such as one woman's trek across Death Valley. (BA-1917—\$12.95)




Guide to Do-It-Yourself Materials This best-selling *Popular Mechanics* guide is back, with advice on choosing and buying the materials you'll need for home repair and remodeling. Learn about lumber, fasteners, plumbing and electrical products, roofing, even garden supplies. Make your work easier with the right materials. (BA-1916—\$8.95)

INTRODUCING

The 1987 Rascal



Medicare
Approved

OUR HIGHEST QUALITY AFFORDABLE ELECTRIC 3-WHEELER

Take this compact, portable 3-wheeler anywhere. Easy One-Hand Operation. Built-In Battery Charger. Rear Suspension System. **MEDICARE** and private insurance reimbursable. 30 DAY FREE trial. Call or send coupon below for a FREE 20 page color catalog.

1-800-662-4548

Electric Mobility Corp., Dept. 1596
#1 Mobility Plaza, Sewell, NJ 08080

Name _____
Address _____
City _____ Zip _____
Phone (____) _____

HUGE SAVINGS

Buy
Direct from
Inland Harbors

Direct Suppliers of —
BOATING • TRAILERING
OUTDOOR PRODUCTS

GENERATORS

ELECTRIC POWER

Where and when
you need it!

- 8 HP Briggs
- 4200 Watts
- 120/240 Volts
- Starts 1/2 HP Motor

Other models
Available
900 9500 Watts

6000 Watt
JUST \$599

Made in the U.S.A.

TRAILER PARTS

Swivel Swing-
Away Jack
23" lift. Bolt-on Wheel

SALE PRICE **\$31.95**

Order in MN
612-941-8280

Order Toll Free
800-544-2525

10" Ag. Jack	25.50
1,000 lbs. A-Frame Jack	16.95
Hand Winches 1,000 lbs. Submersible	19.49
Trailer Light Kit 17.95	28.95
2,000 lbs. Hub complete 4 or 5 bolt pr	23.95
480x8 Wheel & Tire, 4 or 5 hole	18.95
480x12 Wheel & Tire, 4 or 5 hole	32.95
Work Gloves	(pr) 1.75
Leather Work Boots	22.95

INLAND HARBORS
P.O. Box 35068
Dept. 812S
Mpls., MN 55435

Prices expire 7/30/87

**SEND COUPON
FOR FREE 48
PAGE CATALOG**

Name _____
Address _____
City _____ State _____
Zip _____ Dept. 812S

Enlarge Project Designs

Craft Projector is Simple! Fast! Accurate!

Projects on to: Drawing, Graph & Tracing Paper, Wood,
Other Surfaces.



Adjustable lens enlarges by fractions up to 27 1/2 times for the size you wish! Copy unlimited ideas for craft designs. Enlarge patterns, designs, portraits, still lifes, landscapes, photos, slides, designs on coins and jewelry. Projects in exact colors. Does not damage original. Simple instructions. Uses household current and 60 watt bulb. Send \$19.95 plus \$2.95 shipping. 30 day money back guarantee. Norton, Dept. GT130, Box 2012, New Rochelle, N.Y. 10802

ban the flush!



Envirolet.

The Ecological Toilet System

- NO WATER
- NO CHEMICALS
- NO SEPTIC TANK

Sancor Industries Ltd.

140 - 30 Miner Ave., Scarborough, Ont. M1S 3R3
(COA 416-299-6686)
in U.S.A. TOLL FREE 1-800-387-5126



Increase Tire Shop Safety and We Will Give You This Solid Bronze Buckle.

Heavy truck wheel/rim servicing can be dangerous.

Motor Wheel Rim Safety Training kit has material and instructions to help you teach safe wheel/rim servicing and help avoid needless accidents.

Send for free kit.

Post the safety material. Present the program to your service people. Return validation certificate. And we'll send you a Motor Wheel Think Safety belt buckle.

Write: Dept. 91074,
Motor Wheel Corp.,
Lansing, MI 48910



MOTOR WHEEL

LONG-TERM CAR TESTS

(Continued from page 78)

two side-saddle rear jump seats are so small as to be suitable only for small children or someone you don't want asking for another ride. Even a pair of 12-year-olds complained they felt cramped. But it's nice to have someplace to put things out of the rain, and for that use the space is plenty big, especially with the seats folded away.

The macho styling may lure some buyers who want to use it for commuting and shopping. They'll have to put up, though, with the noisy off-road tires, buckboard ride, wide turn radius and tepid engine. The tires are so large that the spare fits nowhere except into the bed, obscuring part of the vision in the rearview mirror. But somehow that doesn't matter when everyone is watching as you cruise through the hamburger stand.—M.A.

Ford Taurus LX

After less than three months and 5500 miles of pleasant driving, Ford asked for its marvelous Taurus wagon back. It seems the accountants had to get this '86 model off the books ASAP, and we reluctantly returned it—after several increasingly pointed reminders—with 7763 on the clock (it had been delivered to us with 2265 break-in miles on it).

We hated to see it go. Although it had finished behind some \$20,000 imports in our "Wonder Wagons" test (page 58, Dec. '86), when judged all by itself the Taurus was pretty wonderful, too. Not perfect—a few minor rattles and "tinkles" had developed—but close enough for a popular-priced domestic wagon.

Two less minor problems were caused by some of our more abusive track-test procedures and are not likely to affect the average Taurus in everyday use. We warped a front disc brake in repeated panic stops, and this was felt as a slight shimmy in the steering wheel when the brakes were applied lightly. The car also suffered minor rear-body damage, which eventually sprung the fuel-filler door so it would not stay closed. Discounting this, we think the Taurus LX is by far the best station wagon now built in America.

Overall fuel economy was 22.2 mpg, which is outstanding for a relatively large wagon with automatic transmission and the big engine—in this case the 140-hp 3-liter V6. Performance felt like that of a European sports sedan, not the traditional wallowing one expects from a wagon. All in all, the Taurus has been a revelation, and I now know why you see so many of them on the road.—W.H.

Oldsmobile Delta 88

The drama continued almost unabated

with our star-crossed Delta 88 Royale Brougham 2-door coupe. You may remember that, in our last installment, the car had suffered a severe case of "the hiccups," which included a blown engine, a fried computer and a number of bumbled repair attempts at two dealerships and a private garage. All this conspired to keep the car off the road for more than three months, making it a prime Lemon Law candidate.

The car had been back on the road for less than a month when the window on the driver's side fell off its track and slid, cock-eyed, down into the door. A small plastic part that holds the glass in its track had broken, and it took three weeks for the dealer to get a replacement. We can see why. The Buick LeSabre we borrowed in the meanwhile had the same thing happen, and Buick's spokesman said it was the second time. Those little plastic parts must be back-ordered by GM dealers from coast to coast!

The Olds rep told us that the dealer had also found and replaced a cracked front brake pad. That may explain why the car had been locking its rear brakes and slewing sideways in panic stops (like when the radar detector started to beep!). Rear-wheel lockup on wet hills had been a problem with our Cutlass Ciera long-term wagon a few years ago, too, so it appears that GM still has not fully exorcised this evil spirit from the infamous X-cars.

Back on the road again, we found the air conditioner inoperative at 7500 miles, but since it was September by then, we decided to grin and bear it. We'd had the car for six months, and over half that time had been spent in various repair shops!

At 8000 miles we noticed intermittent low-voltage readings, and by 9000 miles there was an occasional grating noise from under the hood. A couple of weeks later, at 9400 miles, the inevitable happened and the alternator ground to a halt, leaving the car to limp along on battery power.

At that point, we threw in the towel and asked Oldsmobile to tow the car away. It was November, and the passenger-side armrest had nearly pulled free of the door panel.

We wish GM lots of luck with its new 6-year/60,000-mile warranties. With many cars like this Olds, it's going to cost them a pretty penny. We'd had this example only eight months, and it had proven so unreliable that no staff member trusted it for a long trip. Which was a pity; when it was working, the Delta 88 was a pleasant car with strong performance and good looks. The trouble was that hardly a week went by when *something* wasn't broken or going bad.—W.H.



THREE WIPING EDGES INSTEAD OF ONE!

1 Clearing Edge

2 Cleaning Edge

3 Squeegee Edge



TRIPLIDGE

LIFETIME WIPER BLADE

- The first edge removes the bulk of water or winter snow.
- The second edge removes bugs, road film, dirt.
- The third edge squeezes the glass completely clean.

GUARANTEED FOR THE LIFE OF YOUR CAR.

We guarantee Tripledge Wiper Blades for as long as you own your car! No other wiper blade can offer this guarantee. If you are not completely satisfied you get your money back.

THE WORLD'S FIRST SYNTHETIC WIPER.
Tripledge blades are made from DuPont Norel—the same material used in 50,000 mile radial tires. Tripledge wipers will never tear, crack, split, rot, dry out or stick. Not affected by ice, snow, blazing sun, smog or road chemicals.

EASY, DO-IT-YOURSELF INSTALLATION.
Includes 2 complete units: High Quality Black Metal Superstructures complete with Tripledge Lifetime Wipers. They snap on in seconds.

CUSTOM FIT for virtually every U.S. and import car, van or truck.

AIR-FLO DESIGN. Blades won't lift in high winds, high speeds. 6 claws grip firmly, distribute pressure evenly.

PATENTED DESIGN. Protected by U.S. Patent 4473919.

PRICE PER PAIR ONLY

\$12.95

Specify make, model, year of car.

\$1.05 Shipping & Handling

CALL TOLL-FREE 1-800-847-0653

PA residents please call 1-215-638-8008 or send check, money-order or card number and expiration date of your Visa or MasterCard. Credit card numbers handled with strict security.

TRIPLIDGE WIPER CORP., Dept. 9244 3165 Tucker Road, Bensalem, PA 19020



☐ **YES!** Send me _____ pair of Tripledge Lifetime Wipers—the only wiper **GUARANTEED** for the life of your car.

Name _____

Address _____

City _____ State _____ Zip _____

VISA/MC# _____ Exp. Date _____

Car #1: Year _____ Make _____ Model _____

Car #2: Year _____ Make _____ Model _____

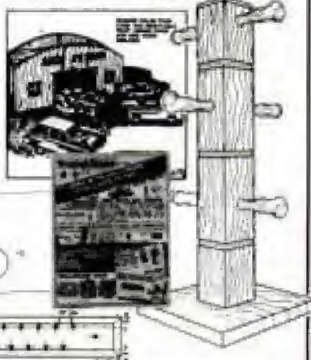
Car #3: Year _____ Make _____ Model _____

Car #4: Year _____ Make _____ Model _____

1 pr. \$12.95
2 pr. \$23.90 Save \$2.00
3 pr. \$34.85 Save \$4.00
4 pr. \$45.80 Save \$6.00
(Single Blades \$6.50 ea.)
Shipping \$1.95 first pair
(Shipping 2nd, 3rd, & 4th pair, only \$1.00 each)

Amt. Enclosed: _____
Pa. Residents Add Sales Tax

\$28.00 Woodworker's Package For Only \$9.95!



As an introductory promotion, a leading mail order company is offering \$28.00 of their most popular woodworking items at an amazing price of \$9.95. The complete package includes 25 full size shaker pegs, 25 mini-shaker pegs, 25 mug rack pegs, and 25 tie rack pegs—plus a detailed full size unique horse design shaker peg plan, a full size plan for a beautiful tie rack, and a full size plan for a useful mug rack.

This alone would be a tremendous value. But you'll also receive full size patterns for 10 great items—a hanger for pot holders, note pad holder, napkin holder, muffin server, doughnut holder, pretzel holder, cleanser holder, knife rack, towel bar, and spice shelf. Plus: full size plans for four nifty cars with their own garage. You'll also receive a woodworking catalog loaded with page after page of discount power tools, hand tools, wood parts, wood fasteners, sanding supplies, wood finishes and much, much more. You may order up to four of these \$28.00 woodworker's packages for \$9.95 each. Include only \$2.95 shipping and handling regardless of how many you order.

**\$28.00 worth of
woodworking items
for only \$9.95!**

Name _____

Address _____

City _____

State _____

Zip _____

Quantity Price Ea. TOTAL

Mail to:
Trend-Lines, Inc.
375 Beacham St.,
Box 6447M
Chelsea, MA
02150

PM77

FACTORY DIRECT GRANDFATHER CLOCKS

Do-It-Yourself Clock Kits

Prices
Starting
Under **\$300**

(including movement and dial)

OR
**Completely Assembled
and Finished**

- Solid 3/4" hardwoods: black walnut, cherry, oak
- Heirloom quality
- Solid brass West German chiming movements and dials
- Easy to assemble kits or completely assembled and finished
- Money back guarantee

**SEND \$1 FOR
32-PAGE FULL
COLOR CATALOG**



**EMPEROR
CLOCK COMPANY**

WORLD'S LARGEST MANUFACTURER
OF GRANDFATHER CLOCKS

Dept. 2423, Emperor Industrial Park
Fairhope, Alabama 36532 • Phone 1-205-828-2316

I am interested in ☐ Do-It-Yourself Kits
☐ Finished Clocks

Name _____

Street _____

City _____

State _____ Zip _____

(please print)



Big on Quality - Low on Cost!



**Big
Garden
Cart**

Heavy 250 lb. capacity!

- Steel support system. • 1/2" exterior grade plywood. • 2 sets of double steel bearings. • 16" x 1.75 semi-pneumatic tires. • Assembly required. • Box: 36" L x 20" W x 10" H. Overall: 48" L.

Order No.
H8264-1768
S. & H.: \$12.00

\$59



**Folding Universal
Aluminum Ladder**

Great for reaching second-story windows and bothersome tree branches! Can be used as a 12' ladder, 2-man scaffold, also fold & secure at 90° to work in stairwells. Six specially designed hinges rotate to any of 3 positions and lock! Features: • Made of heavy gauge aluminum. • Built to industrial standards. • Folded size: 23 1/2" L x 9" W x 40 1/2" H. • Weight: 30 lbs.

Compare at \$130.00

Order No.
H8247-1310
S. & H.: \$14.00

\$89

**Ultrasonic
Pestrepeller**



Powerful, pulsating soundwaves that drive pests away - rats, mice, fleas, roaches, mosquitos, flies & more! Features: • Covers 2500 sq. ft. • 1N capacitor offers stable high frequency. • Output sound pressure - 130 dB.

Order No.
H8267-1123
S. & H.: \$3.00

\$19

6000 Watt Power Generators

Auxiliary power during outages, in the field, or at the cabin! Both models feature: • 8 HP Briggs & Stratton engine. • Magnetron® solid-state ignition. • 1-120V duplex & 1-240V duplex receptacles. 36.7/18.3 amps. • 6000 watts surge, 4400 watts continuous power. • Rotary field design. • Circuit breakers. • 1 year limited warranty.

Compare at \$1200.00
A. Order No. H8240-1034.

\$499

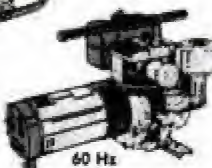
Compare at \$1000.00
B. Order No. H8240-1018.

\$399

Both Models: Shipped Freight Collect



A. Recoil & Electric
Start - 29 1/2" L x
20 1/2" W x 19 1/4" H.
Shipping Wt.
152 lbs.



B. Recoil Start -
25" L x 17 1/2" W x
17 1/4" H. Shipping
Wt. 129 lbs.

ORDER TODAY!!



For credit card orders: **1-715-674-5000**
OR
1-800-826-3403

We use TeleCheck® if ordering by mail & paying by check, provide st. address, phone #, & driver's lic. #.



Wholesale America, Inc.

4777 Menard Drive, Eau Claire, WI 54703

For Mail-in Order - type/print on clean paper product name(s) & order no.(s) along with your name & address. Send check/money order payable to Wholesale America, Inc. (note: add ship./hand. chrgs.). To charge to MasterCard, VISA or DISCOVER, give acc't. #, exp. date and sign name. Allow 7 days for UPS delivery. Add 2-3 wks. for freight collect items. Residents of AK, HI, Canada, Puerto Rico and Virgin Islands, add 50% to ship./hand. WI residents - add 5% sales tax.

Send \$1 for the latest Money-Saving Catalog from Wholesale America! Includes Huge Savings on Power Tools, Hardware & Housewares!

**10 DAY
No Hassle Guarantee!**



**NOW!
The
Affordable
OAK Spiral.**

**ONLY
\$1475** FOB Broomall, PA
(for 4' diam. (fits 8' to 8'8 1/2"))

Comparable savings on 5' diam. and other floor-to-floor heights.

© The Iron Shop 1985/87

Our Oak Spiral Stair Kit is superbly crafted from choice, selected oak and ingeniously designed for easy do-it-yourself assembly. And best of all, it's priced well below any comparable stair on the market!

CALL OR WRITE FOR FREE COLOR BROCHURE:
THE IRON SHOP (215) 544-7100
Dept. OPM77 P.O. Box 128, 400 Reed Rd.
Broomall, PA 19008

MasterCard, VISA and AMEX

Other Showroom & Warehouse Locations in:
Pomona, CA (714) 598-5766
Houston, TX (713) 789-0648
Sarasota, FL (813) 923-1479
Chicago, IL (312) 952-9010

THE IRON SHOP
MANUFACTURERS

CLASSIFIED ADVERTISEMENTS

Sophie Gronowicz, Classified Sales Manager Dorothy Nolan, Classified Service Manager

Rate: \$7.00 per word payable in advance each insertion. Minimum insertion ten words.

Bold face capitalized words—\$1.00 per word additional (First word set in Bold Face at no extra charge, Zip Code Free.) Centered Headlines in All Bold-Face Letters—\$45.00.

The next available issue to place an advertisement in America's No. 1 Classified Section is **SEPTEMBER**. The closing is **JULY 3rd**. Send remittance payable and order to Popular Mechanics, Classified Department, 224 West 57th Street, New York, New York 10019.

Please indicate Heading under which ad is to appear. As a consumer service and in cooperation with our mail-order advertisers who use post office box addresses for their convenience in handling your order, Popular Mechanics maintains a register of such mail-order advertisers containing their complete names and street addresses.

Advertisers using P.O. Box number must furnish complete name and street address for our records.

To avoid delay in the publication of your ad, please send samples and descriptive materials with your request if your ad does not state clearly what is being offered.

**PLEASE NOTE: WE HAVE 142 CLASSIFICATIONS TO CHOOSE FROM.
FOR OUR LIST WRITE TO ADDRESS ABOVE AND REQUEST OUR ORDER FORM.**

PUBLISHER'S MART BOOKS & PUBLICATIONS

PUBLISH Your Book! Join our successful authors. All subjects invited. Publicity, advertising, beautiful books. Send for fact-filled booklet and free manuscript report. Carlton Press, Dept. PM, 11 West 32 Street, New York 10001

CHANGE Bad Credit Into Good Credit rating almost overnight. Enjoy life again! Free Report. Caldwell, 216 Harmon Hl., Hopkins, S.C. 29061

BOOKS Hundreds of unique titles. 24 page catalogue only \$2.00. Gemstore, Box 399, Holland, N.Y. 14080

SLASH MORTGAGE PAYMENTS in half! Barlow, Box 897, Blaisden, CA 96103

BUILD YOUR OWN BUSINESS Silk Screening Jackets, Hats, T-Shirt And More. Publication Includes Set Up, Listings For Suppliers Of Quality Equipment, Supplies And Raw Goods Also Techniques In Sales Marketing. Learn What Takes Years Of Experience, Start Your Successful Business Send \$10.00. H&H Screening, Dept. A, 60171 CR13, Elkhart, IN 46517.

YOU Can Stop Smoking! Free information—Miller, 2545 Mulberry Dr., S. Clearwater, FL 33519

END LAWNMOWER FRUSTRATION Illustrated Booklet "When It Won't Start" troubleshooting guide, \$7. JWD Publications, Box 1001A, HSU Station, Abilene, TX 79698

REPORT - HOW to open the Door to Riches. Send \$6.00 to: Wallforn Enterprises, Inc., Dept. PM7, Box 276, Rouses Point, N.Y. 12979-0276

TEST YOUR I.Q. Third Edition ... Accurate Results Guaranteed. Send \$3.00 to: Scholastic Publications, Box 18121, Salem, Oregon 97305

PREPARE child for best, safest day care. How to select it. What to bring. Guarantee health. Guard against abuse. Prepare yourself. Comprehensive guide. By day care director/mother. \$5.95 Guaranteed! Cottage Publications, Box 298-P, Taft, Okla. 74463-0298.

POPULAR MECHANICS "PLANS AND IDEAS" CATALOG #1700 — Hundreds of ideas on workshop projects, plans for shop tools, storage houses, boats, furniture, toys — just about everything! Send \$1.50 to: **POPULAR MECHANICS P.O. BOX 1014, RADIO CITY STA., NEW YORK, N.Y. 10101**

MAGAZINES

WORLDWIDE ENGLISH MAGAZINES/NEWSPAPERS. Sampler: 4/\$2.98 **FREE BROCHURE.** Multinewspapers, Box DE87, Dana Point, California 92629.

8,000,000 people read Popular Mechanics Magazine every month. By placing your ad here, for \$7.00 a word, zip-code free, you can get them to subscribe to your magazine! Send your ad plus check or money order to: Popular Mechanics Classified, 224 W. 57th St., New York, NY 10019

CATALOGS

FLAGS! FLAGS! FLAGS! American, State, Religious, Foreign. Home and business **FLAGPOLES. FREE CATALOG!** Write: **LIBERTY FLAG**, 424-PM East Main Street, Reedsburg, WI 53959 or **CALL** 808-524-2634.

BUY KNIVES, CUTLERY ITEMS at Wholesale. Save up to 60%. Huge Selection, Satisfaction Guaranteed, Fast Service. Send for **FREE** Catalog. Smoky Mountain Knife Works, Box 714PM, Sevierville, TN 37862.

PORTER'S FREE PHOTO/VIDEO CATALOG BEST IN THE INDUSTRY

OVER 4,000 products — Brand names, many unique and unusual items, discount prices and Fast service. For your Free copy write: Porter's Camera Store, Inc., Box 628, Dept. PM, Cedar Falls, Iowa 50613 or phone: **1-800-553-2001**

LETTER CARRIERS! Write today for your **FREE CATALOG!** Postal Specialties, Dept. 7A Box 2306, Provo, Utah 84603

BUILD SMALL UNIQUE PROJECTS Small electromechanical parts. Send \$2 for new catalog and idea book. **FREE** product sample included. Inventors Hardware, Box 8460, Anaheim, California 92802

AUTOMOBILES

FREE AUTOMOBILE SECURITY CATALOG: Largest selection available. Do-It-Yourself. Pagers, alarms, hood/locks, glass detectors. Allow 4 weeks. Immediate Delivery. Send \$1.00. Automotive Security Equipment, Dept. 2, P.O. Box 382, Plainview, New York 11803

10,000 AUTO PARTS below wholesale, in stock for immediate shipment! **FREE** information. Consumer Discount, 10420 Lackland, St. Louis, Missouri 63114. 314-427-0090

RUST-CURE eliminates rust and protects against rusting. Liquid formula applies easily. Gives rusted objects years of additional life. \$6.95 + \$1.50 P&H. Coracle Products, Mail Order Dept., P.O. Box 29547, Cleveland, OH 44129

SAVE on your next **AUTO**, \$3.00 **FORMER SALESMAN.** TIPS, Suite 495, 1151 Aquidneck Avenue, Middletown, R.I. 02840

HOW TO MAKE YOUR CAR LAST LONGER, even 20 years. Six guaranteed solutions \$10.00. Arie's Car Clinic, Box 206, Blackfoot, ID 83221

DISCOUNTS ON NEW CARS! Free details! Write: Infovision, P.O. Box 622PM7, Marion, MA 02738

IS IT True You Can Buy Jeeps for \$44 through the U.S. government? Get the facts today! Call 1-312-742-1142 Ext. 7133.

CAR COLLECTORS AND RESTORERS - find your dream car plus all the parts you need in **HEMMINGS MOTOR NEWS**, world's largest old-auto marketplace since 1954. Over 600 pages each month listing thousands of old cars, parts, services, supplies and more. Your best chance to buy, sell or swap. Subscribe today and save 62% off the newsstand price - only \$17.95 for 12 giant issues. Satisfaction guaranteed. P.O. Box 100, Dept 7718, Bennington, VT 05201.

YOUR CAR WILL RUN ON AIR. (With only a tiny amount of gas vapor around the spark plugs.) Send \$2.00 P&H. Jet Spark,™ 3210 Ave. H., Lubbock, Tex. 79404

BACKYARD Car Mechanic Guide \$3.35. Lemon Tree, Box 444, Thorndale, TX 76577

HYDROGEN AUTO FUEL FROM WATER. Amazing Free Report. Merit, 2307 Tyler Lane, Louisville, KY 40205

YOUR Autos could run more than 100,000 miles without major repairs. 40 Simple How To Tips That Work. \$3.00. JW, Box 405B, 2958 N. Campbell, Tucson, AZ 85719

SUPER Mileage Carburetors! Do They Work? **FREE DETAILS.** TDC, Dept. 687A, 304 San Miguel, St. Charles, MO 63303

RESTORING AUTO, TRUCK MACHINERY FOR PROFIT, HOBBY. Illustrated Booklet Shows Economically How. Send \$5.00 to: NRN Enterprise #304 449 Encinitas Blvd., Encinitas, CA 92024

VIDEO: ENGINE REBUILDING Small block Chevrolet disassembly and complete rebuilding. View 103 minutes of step by step instructions. Call free 1-800-346-4336. \$39.00. Videosmith, Box 19156P, Cheyenne, WY 82003

USED CARS Make Money! 7 Sure Methods. Immediate Opportunity ... Free Money-making Report. Automoney I, 1298 Somcenter, Cleveland, Ohio 44124.

UNIQUE New Summer Driving Accessory Catalog. **FREE.** MCI, Box 4800-E, Sparks, NV 89432-4800

VAPOR Carburetor Triples MPG. Free Information. H&A, R2 PV, Bowling Green, MO 63334

"AMAZING!" Drive a new car-Only \$49 monthly! Receive Free Products too! Free Details-Send Stamp - Campbell, 1442 Kona, Honolulu, Hawaii 96814

AUTO SUPPLIES & EQUIPMENT

AUTO BOOK CENTER stocks 2000+ Titles. Repair, Owner's Manuals, All Makes 1920-86. Catalog \$1.00. ABC, 48PM Appleton, Auburn, MA 01501. Ph: 617-832-3081. VISA, M/C.

ADVANCED SOLAR TECHNOLOGY Gives Car Battery Constant Charge To Help Overcome Self-Discharge And Drain From Constant Electrical Loads. Starts Working As Soon As You Plug It In. Measures 14" x 4 1/4" \$49.95. Bay Marketing, P.O. Box 18033, Baltimore, MD 21220

ALTERNATOR Generator Rebuilding Book. Price: Hedelund Engineering, Box 26024, Las Vegas, NV 89126.

PARTS: Army Jeep and truck parts. Spare Parts & Equipment Co., P.O. Box 751, Lexington, Kentucky 40587-0751

ENGINE OVERHAUL KITS: WHOLESALE CATALOG \$2.00. ESG, Dept. PM, Box 13053, Lansing, MI 48901

DECREASE OR ELIMINATE PINGING (SPARK KNOCK) IN MOST CARS, make a water injector. Plans \$3.00. J. Hogan Enterprises, Box 857, Pittston, P.A. 18640

CAR WINDOW AND SURFACE SPRAY CLEANER All in one. Container, sponge, squeegee. \$4.49 to: Inter-Arm Enterprises, New York, NY 10021

STOP MAIN BEARING OIL LEAKS with **HAPCO MAIN-STA. STOP TRANSMISSION** or **POWER STEERING LEAKS** with **HAPCO TRANS-SEAL.** Since 1960 - Guaranteed. Send \$5.50 Each or any Two For \$10.00 Postpaid. Heavenly Products, Box 222, St. Clair Shores, Mich. 48080

(Continued on next page)

AUTO SUPPLIES & EQUIPMENT

(Continued from preceding page)

ECONO Carbs Save Gas. Increase power \$1.00 for brochure information: Vacuum Carburetor, 575 Spencer Lane, San Antonio, Texas 78201

AUTOMOTIVE air conditioning parts discount prices: Catalog \$2.00. Auto Air Supply, 166 Placid Heights, Seguin, Texas 78155.

MOTALOY ring valve job while driving. Guaranteed. \$10.00, two \$18.00. Postpaid. Andris, Box 34081, San Francisco, CA 94134. Dept. A

MONITOR All Exterior Lights On Your Vehicle. Installation Kit \$10.00. Lightwatch, 762 Olive, Denver, Colorado 80220

MOTORCYCLES, MOTORSCOOTERS & SUPPLIES

MINI-BIKE Kit-\$49.00. Go-Karts, 2, 3 And 4-Wheel ATV's, Engines, Wheels, Tires, Clutches and Accessories. 1987 40 Page Wholesale Catalog-\$2.00. Go-Karts & Kits, P.O. Box 755, Closter, NJ 07624-0755.

GO-KARTS factory direct, from \$39.95 to \$239.95 complete catalog \$1.00. Schmieder, P.O. Box 142, Springtown, PA 18081

GO KARTS, Minibikes, Atv's, Kits, Parts, Engines. Lowest Prices. Largest Selection. 80 Page Catalog \$3.00. Refundable. Kart World, Dept. C., 1488 Mentor Ave., Painesville, Ohio 44077

AVIATION, HANG GLIDING

DESIGN-Build Airplanes, Hang Gliders. Simplified publications brochure 25c. McCoy Aircraft, Suite 243, Box J, Manhattan Beach, CA 90266

HOMEBUILT EXCITEMENT. Build "CHOPPY" hobby helicopter. Simplified construction - motorcycle engine. Plans: \$20. US, brochure: \$3. POLYNOVA, Box 670M, St. Remi, Quebec, Canada J0L 2L0

IT'S TRUE! No license required, any age can fly safe inexpensive airplanes. Information \$5. Aerotec, Rt. 1, Box 1025, Quinlan, TX 75474

AIRBOATS-Hovercraft. Plans, Kits, Engines, Airdrives, Propellers, Accessories. Catalog \$3.00. Sportsraft, Box PM, Meeker, OK 74855

PROPELLERS

PROPELLERS - for Hovercraft, Ultralights, Homebuilts, Wind Generators. Information \$1.00. Aerotec, Rt. 1 Box 1025, Quinlan, TX 75474. 214-447-2010

SPACE & ASTRONAUTS

SECRETS OF UFO PROPULSION. Book, 170p. \$8.85. Prescience Publications, 1330 1/2 Sutherland, Los Angeles, CA 90026

NASA emblems, toys, gifts, collectibles. Catalog \$1.25. Refundable. Collector Trends, Box 361, Dayton, Ohio 45409

BOOMERANGS ... HI-TECH RETURNS! Polycarbonate, Paxolin, Wood Constructed. World's Best! Collectible. 11th Annual Catalog. FREE! BoomerangMan, 1806-1 N. 3rd., Monroe, LA 71201-4222

DEEP Space Astronaut Explorer Conqueror Colonizer 33 trillion times the speed of light exp. Writer: Richard Spodin. 1431 Monument #45, Concord, CA 94520

HOVERCRAFT

HOVERCRAFT Plans All Sizes. Catalog \$1.00. Universal Hovercraft, Box 281, Cordova, Illinois 61242

AERO-CAR Amazing Hovercraft built easily with ordinary tools. Lawnmower engine power. Carries one man plus. Hovers, flies forward, backward. Sideways over land/snow/water. Complete construction plans and brochure. \$10.95. Aero-Projects, Box 5118PM, Clinton, New Jersey 08809.

VW HOVERCRAFT Information \$10. Plans \$25. Neoteric, Box 2438, Melbourne, Australia, 3001

ADVANCED Ultralight Hovercraft. Real Performer, Comprehensive Infopack, \$8.00. Certified Cheque/Money Order, ULH, Box 478, Carleton Place, Ontario, Canada, K7C 3P5

BARTLETT Flying Saucer Ultra-Light Hovercraft Featured In Documentary Film, "Force Beyond." Powered By Ordinary Lawn Mower Engine. Complete Plans \$10.00 Send To: Herb Bartlett, P.O. Box 156M, Silverdale, WA 98383

HOVERCRAFT PLANS & PUBLICATIONS Catalog. \$1.00. Lansing Aero-Marine, P.O. Box 27655, Lansing, Michigan 48909

BRITISH & American 2-88 Passenger Hovercrafts Available. Live Action Footage On VHS Video 1 Hour \$40.00. **DETROIT INTERNATIONAL INC.**, 11800 Merriman, Box 9108, Livonia, MI 48151. Visa & Master or Money Order (313) 478-9432 (1-800) 334-5184

PEGASUS: Hover over fields, parking lots or any surface that's flat and hard in this floating machine. Build it yourself for about \$150 worth of plywood and paint and an old lawnmower engine. The Pegasus has a 7-Ft. Dia. and hovers 10" above the ground. A gallon of regular gas provides 3 hours of flying time. PC-1800 - \$9.95: Send Order To: Popular Mechanics, P.O. Box 1014, Radio City Station, New York, NY 10101

CB'S, RADIO & HAM EQUIPMENT

POLICE Scanners, Bearcat, Regency. HPR, Box 19224, Denver, CO 80219.

MAXON RADAR DETECTOR. Model RD-2, Latest in technology at an affordable price. Money back guarantee. Only \$69.95 plus \$2.00 shipping. The Chandler Company, 1135 Winnrose Street, Jackson, MS 39211.

ELECTRONICS

BUGGED? WIRETAPPED? Find out fast! Countermeasures equipment catalog \$1. Capri Electronics, Box 589P, Bayfield, CO 81122

ELECTRONICS FOR SECURITY, COUNTERSURVEILLANCE AND PERSONAL PROTECTION CATALOG \$1. HUNTEREX, BOX 12922, WINSTON-SALEM, NC 27117

NIGHT VISION SCOPES. Reconditioned Military units. Both Starlight (Passive) and Infrared (Active). Catalogs \$4.00. STANO Components, P.O. Box 6274, San Bernardino, CA 92412, (714) 883-2728.

MINIATURE FM WIRELESS MICROPHONE. Powerful. Simple assembly. Plans \$3.00 Complete kit \$9.95. RADIO, Box 3543, Williamsport, PA 17701

COMPUTERS & SOFTWARE

TI-99/4A Software/Hardware bargains. Hard to find items. Huge selection. Fast Service. Free Catalog. Dynamic, Box 690, Hicksville, N.Y. 11801

COMPUTER FACT BOOK Learn about Computers the Easy Way, for FREE Information write: Computer & Arts, 5560 La Jolla Blvd., Suite 472-H, La Jolla, CA 92037

SOFTWARE. IBM, compatible, or Apple, less than \$4.00 disk, send stamp for catalog. PSCa, Box 1057, Capitola, CA 95010

STEREO, CASSETTE TAPES, ETC.

THOUSANDS OF OLDIES! Hard-to-find 45 rpm hit records from the last 40 years including pop, country, rock and soul. Send \$2.00 for catalog to: American Pla. P.O. Box 66455, Dept. PM, Los Angeles, CA 90066

TV & VIDEO EQUIPMENT

NOTICE: USE OF CERTAIN ITEMS IN THIS CLASSIFICATION REQUIRES STATION AUTHORIZATION.

CABLE TV CONVERTERS. Scientific Atlanta, Jerrold, Oak, Zenith, Hamlin. Many others. "New" VIDEO HOPPER "The Copy Killer". Visa, M/C & Amex Accepted. Toll Free 1-800-826-7623. B&B Inc., 10517 Upton Circle, Bloomington, Mn. 55431

SATELLITE TV SYSTEMS. Upgrade Electronics. Buyers Guide. Discount Prices. \$3.00. NECS Inc., Box 22808-MI, Little Rock, AR 72221

HOW to clean and service your VCR. Step by step video tape. 90 minutes. Specify VHS/Beta \$21.95. Visa/M/C, Amex accepted. Salco, 318 Mesa Verde Ave., Palmdale, CA 93550

CAMPERS & TRAILERS—KITS, PLANS

BUILD YOUR OWN - Travel Trailer - Fifth Wheeler - Motorhome - Camper - Pickup Cover - Plans - Patterns - Kits - Catalog \$1 - Glen-L R-V's, 9152PM Rosecrans, Box 1804, Bellflower, CA 90706.

BOATS, OUTBOARDS, TRAILERS, & KITS

BOAT KITS - PLANS - PATTERNS - 250 Designs - 8'70" - Plywood - Fiberglass - Steel - **POWERBOATS** - Cruisers - Houseboats - Hydroplanes - Runabouts - Duckboats - Canoes - Kayaks - Dories - Prams - Sailboats - Daysailers - Trailersailers - Multihulls - **SUPPLIES** - Epoxies - Polyesters - Cloth - Foam - **CATALOG** \$3.00 (Airmail \$5.00) (Book Amateur Boatbuilding, \$8.00). **CLARKCRAFT**, 16-P Aqualane, Tonawanda, NY 14150

EVINRUDES - NEW 1986 BARGAINS - TOP BRANDS ... all sizes ... \$2.00 handling ... Scott McCulloch parts ... Electra Marine, 610 Merrick Road, Lynbrook, New York 11563

BOAT Plans - Patterns - Kits - Hundreds of designs - 7'55" - Sailboats - Powerboats - Sportfishers - Houseboats - Rowboats - Duckboats - Bassboats - Canoes - Kayaks - Hydroplanes - Dories - Boattrailers - Simple construction - Proven instructions - Tremendous savings! Gigantic 160-page catalog \$3.00 (\$4.00 Airmail) - Includes Free "Boatbuilding Supplies" catalog - Fiberglass - Fastenings - Glues - Books. Revolutionary "Poxygrip/Poxysield" manual \$2.00. Glen-L, 9152 Rosecrans, Box 1804MP, Bellflower, CA 90706

BOAT KITS - SAIL 16'-30'. **FIBERGLASS**. Save half. Anyone can assemble. **FREE** 40 page catalog. **LUGER**, Dept. BC-77, P.O. Box 1398, St. Joseph, MO 64502. 1-800-BOAT KIT in MO: (816) 233-5116.

FIBERGLASS Boat Building Materials Call or Write for **FREE** Catalog 1-800-237-9511 or FL residents 1-800-282-9496. Suncoast Fiberglass, 2680 Palm Beach Blvd., Fort Myers, FL 33901

SEE BOATS YOU CAN BUILD FROM OVER 300 PROFESSIONAL DESIGNERS! In Boatbuilder's International Directory, the established completely independent guide for **PLANS, KITS, HULLS, MATERIALS, ENGINES, RIGGING, TOOLS**, etc. **DINGHYS to YACHTS WORLDWIDE**. **NEW** 8th edition bigger & better than ever, only \$5.50 plus \$1.50 shipping. **BOATBUILDER'S DIRECTORY**, 1001 Bridgeway Dept. 621M, Sausalito, CA 94965.

CAMPING EQUIPMENT & TENTS

MRE'S, Freeze Dried & Storage Foods. **FREE CATALOG!** Survival Supply, DPM, 15010 Keswick, Van Nuys, CA 91405

RV/CAMPER owners, Amazing Slipnot™, many uses, free sample. Bright Ideas Unlimited, Box 18709, Irvine, CA 92713

OUTDOOR EQUIPMENT

PICNIC TABLE: Stowaway Picnic Table is a clever one-piece design that folds like a scissor for convenient storage. Easy to build. (PC-1716-\$5.95). Send order to: Popular Mechanics, P.O. Box 1014, Radio City Station, New York, NY 10101

ATHLETIC EQUIPMENT AND BODY BUILDING COURSES

BIGGER, More Powerful Muscles - faster! Free Booklet! Universal, Box 6894A, Detroit, Michigan 48240

GUT Busters \$10.00 S&H \$2.00. D&R Brothers, 523 South Castle Drive, Salem, IL. 62881

KUNG-FU Free Lessons. Send \$1.00 for Postage. McLisa, Box 1755, Dept. PM87H, Honolulu, Hawaii 96806

FISHING, TACKLE, LURES

LEARN FISH FILLETING! Step-by-step instructions and illustrations. \$3.95 plus 50c postage/handling. Filleting, Box 29A, Clarksburg, Missouri 65025

FREE Sinkers Mold Catalog over 100 molds 25 shapes. Carmen's, Box 220PM, West Newton, PA 15089

GUNS, DECOYS, HUNTING

BEEMAN HIGH POWER ADULT AIRGUNS, Fine Firearms, Magnum Slingshot. Guaranteed best prices for the very finest. Unexcelled power yes, but more importantly: unequalled accuracy. Trigger action, durability, ownership pride. \$1 Lifetime Repair Policy. Mention code PMC for **FREE** Airgun Catalog/Firearm Information. Add \$1 for fast mail. Beeman, 3440-PMC Airway Dr., Santa Rosa, CA 95401-2040.

BATTERY REBUILDING SCHOOL

TECHNICAL breakthrough in battery chargers-uses 1/2 the electricity compared to old type. Technical breakthrough in carbon pile testers-no burnout! Moore Tool & Cover Company, 10415 US 98, Sebring, FL 33870. 813-655-1616

ENGINES, MOTORS

NEW Lightweight 8 H.P. Engines \$99.00. U.F.M., 922D Industrial, Lodi, Calif. 95240

SMALL ENGINES Galore! Free Discount Catalog. Engines, Box 186P, Ashland, MO 65010.

(Continued on next page)

GENERATOR KIT 5 H.P.-2400 Watt, Assemble in minutes, Save hundreds. Send \$5.00 (refundable) to: Gen-KIT, PM8704, P.O. Box 160, Rockford, MN 55373. Dealers Specify.

MONEY BACK GUARANTEE. SAVE MONEY! Extend life of your engine. Analyze engine condition. PMA, FAA approved. Information \$3.00. K-R Enterprises, Rt. 2 Box 72, Savage, Montana 59262

VIDEO: Briggs - Stratton Tuneup \$39.95 VHS/BETA or for info. Portable Services, P.O. 1082, La Salle, IL 61301

TOOLS FOR SALE

BOLTS, SCREWS, TOOLS, WHOLESALE, DIRECT. Guaranteed. Catalog \$1.00 (Refundable). Camelot, Dept. 44, Box 65, Bristol, Wisconsin 53104

POWER TOOLS AT WHOLESALE. SHIPPED FREE, FAST. FREE CATALOG. BEAVER TOOLS. CALL FREE 1-800-992-2877.

UNUSUAL TOOLS FROM BRITAIN & EUROPE. Home & Shop Catalog \$1.00 Refundable with Order. Unique Tools & Access. P.O. Box 1967PM, Beaumont, TX 77704.

AIR TOOL KIT includes paint gun spray degreaser blow-gun tire inflator/gauge 12' coil hose remarkable quality for \$59.95 write or call CCS, 145 E. Merrick Road, Freeport, N.Y. 11520. (516) 823-3352

UPHOLSTERY SEWING MACHINES

UPHOLSTERY Sewing Machines with Walking Feet. Complete ready to use only \$510.00. Thompson Model PW201-AVAILABLE FROM YOUR LOCAL DEALER, or order direct (Master Charge-Visa). Detho Mfg. Inc., P.O. Box 12110, Lubbock, Texas 79452-Phone: (806) 744-6774

MACHINERY, TOOLS & SUPPLIES

SCHLESINGERS FOR TOOLS, LTD. CELEBRATES ITS 20th ANNIVERSARY WITH A HUGE SALES BULLETIN OF THOUSANDS OF BARGAINS. GET YOUR COPY 75¢. 60 MAIN ST., DOBBS FERRY, N.Y. 10522

4" METAL Cutting Lathe \$104.50. Tag. 15048 Proctor, Industry, CA 91746

BEST Prices. Woodworkers Machinery Catalog. Free. McKilligan, PMC87, Johnson City, N.Y. 13790

SMALL FOUNDRY Furnaces. Supplies. Free literature. Pyramid Products, 3736 South 7th Avenue, Phoenix, Arizona 85041

"SHARPENERS REPORT" Monthly Newsletter, Sharpening Guidebook, Angle Wall Chart, Free details. Skog Company, Dept. PM7, P.O. 22559, Minneapolis, MN 55422

BANDSAW BLADES, Any Size. Free literature. King Saw, 6541 Tidewater Drive, Norfolk, Virginia 23509

LATHES, Mills, Tools. New catalogs \$1.00. Blue Ridge, Box 536V, Hurricane, WV 25526. 304-562-3536.

LATHE OWNERS Low Cost Quick Change Tool Post. KRF, Box 783A, St. Joseph, MI 49085. 616-429-7050

STEEL, Aluminum, Brass—Sheet, Bar, Shop Supplies, Plans. Write: CEL RR1, Box 163, Cameron, IL 61423.

LATHES - INDUSTRIAL/HOBBY FROM \$295.00, METALS, SUPPLIES. LARGE CATALOG \$2.00. CAMPBELL TOOLS 32nd YEAR. 2100-D SELMA RD., SPRINGFIELD, OHIO 45505. 1-513-322-8562.

"SHARP BUSINESS" Sharpener's Newsletter plus FREE Bimonthly Buyer's Guide! P.O. 10542, Springfield, MO 65808

ELECTRICAL MOTOR WIRING, reversing. Three Phase on single phase. Simple instructions, plans, book. \$4.00. M. L. Bock, 3730 Arlington Road, Bloomington, Indiana 47401

SOUTHBEND Lathe parts and Accessories. New and used Woodworking Machinery SASE. Plaza Machine, RD2, Bethel, VT 05032. (802) 234-9673

ENERGY SAVING

SAVE ON AIR CONDITIONING ELECTRICAL CONSUMPTION. Professional Repairman's Video Shows How. \$25.00. Rick's, Route 4, Elberton, GA 30635

SAVE Money On Gas Bill. Install Gas Saver On Water Heater. Send \$1 For Brochure. Refundable. Walker, P.O. Box 12029, Omaha, Neb. 68112

SOLAR & ALTERNATE ENERGY

SOLAR HYDRO-ELECTRIC, WIND POWER equipment CATALOG. U.S. addresses send \$3.00, all others send \$6.00 in U.S. funds to: WESCO, Box 936, Redway, CA 95560

SOLAR Drying. 48-pages. Nine patents, drying hints. \$7.00. Free information. Jamye, 1600 Mockingbird, Azle, Texas, 76020

FREE! Solar Energy Products catalog. Gil Electronics, Box 1628-J, Soquel, CA 95073

WIND-ELECTRICITY. Extremely efficient, reliable, inexpensive, patented systems up to 100 KW. Complete info. \$3.00—Distributorships available. ENEREX Corp., P.O. Box 4109, Princeton, FL 33092-0109

4x8 solar collectors for pools. \$88 each. Call for details. (604) 266-0085 (recording)

HOME CRAFTSMAN

OVER 125 FULL SIZE PATTERNS! Create profitable wooden gifts, toys, household accessories... more! Patterns PLUS "Shop Secrets" and brochure. Only \$7.00. Accents (P-77), Box 7387, Gonic, NH 03867

WOODCRAFT PATTERNS, Windmills, Wishing Wells, Bird Houses, Feeders, Flying Duck, Pheasant, Outdoor Planters. Catalog \$1.00. Crafters, 11840 US, 27 North, DeWitt, Michigan 48820

FAVORITE WOOD TOYS, Patterns, Parts, Wheels, Catalog \$1.00. Toys and Joys, Box 628M, Lynden, Wash. 98284

CATALOG FULL-SIZE FURNITURE PLANS - \$2.00. Re-fused with first order. Traditional, Early American, over 1801 Furniture Designs, 1827 Elm Dale, Dept. CP-87, Glenview, Illinois 60025.

PVC PIPE FURNITURE Plans, Kits And Supplies. Free Brochure. Casual, Box 208, Tewksbury, MA 01876

REPAIR Silver, Pewter, Brass, More. Profitable Craft. Free information. SASE. Institute Of Metal Repair, 1558 So. Redwood, Escondido, CA 92025

BATTERY CLOCK MOVEMENTS. Below wholesale prices. Best Quality. Catalog \$1.00 (refundable). Yankees, Box 26, Thompson, Connecticut 06277

WATERBEDS. Build your own from easy plans and pictures. Send \$5. (with size requirements) to: WATERBEDS, Dept. P7, Box 338, Granby, MA 01033. Purchase includes FREE information on hardware and accessories.

CLOCK DIALS, Portrait, Wedding, Anniversary, Award, Retirement, Family Tree, CUSTOM ENGRAVED. Eric, Box 668, Richton Park, IL 60471-0668

SAWBUCK-Fascinatingly new design lets you cut round timber or slabs quickly, with chain saw. Plans \$2.00. Sawbuck, Box 731, Rural Hall, N.C. 27045.

PROFITABLE WOODEN "COUNTRY CRAFTS", Made \$2,000 one weekend. 100 full size patterns and details only \$6.00. Hartville Woodcrafts-P77, 12355 Market, Hartville, OH 44632

WOOD, WOODWORKING

CREATE heirloom stick-horse clothes tree for little kids. Plans \$5. Stovell, 2900 Maxwell, Midland, Texas 79705

PROFESSIONAL FULL-SIZE PLANS for building toys, furniture, clocks, cradles and other great projects. Catalog \$1.00. Armor Products, Box 445C, East Northport, NY 11731

ROCKING Pony Plans, Cute Easily Built, 30", \$4.95. Alan Moody, R#1 Box 63, Broadlands, IL 61816

FREE WOODWORKERS CATALOG: Waverly Woodworks, Dept. 42J, Route 5 Box 1204, Forest, Virginia 24551. (804) 525-7247

PLANS, BLUEPRINTS, PROJECTS

PLANS. Mystifying Illusions, Exotic Electronic Gadgets. Catalog \$1.00. D. Taylor, P.O. Box 1612, Destin, FL 32541

PLANS FOR 200+ TOOLS, Catalog \$1.00 Refundable. Wood-Met, 3314 Schoff, Peoria, IL 61604

GO-CART Plans and Complete Instructions send \$8.00 to: H&E Design And Fabrication, Box 38, Richmond, MI 48062

SMALL Cottage/Rental. 13 Pgs. Plans 1/4" Scale. Designed By Contractor W/39 Years Experience. \$15 Plus \$3 Postage/Hdg. Seville Specialties Supply, Box 250, Delmar, CA 92014. Allow 2 Weeks.

ONE DAY PROJECTS - Large decorative toy box/bench Plans \$6.00. ShiftToys, P.O. Box 793, Newport News, VA 23607

FULL SCALE Toy Model-T Wood Working Patterns For 3 Models. \$5.00: R-D Enterprises, Box 1933, Dept. TPM3, Mount Vernon, WA 98273. (Catalog \$1.00)

SINGLE SHEET Plywood. Desks, beds, tables, more. 10 plans, \$10.00. Specify PMSet. Quale, 3633 Pamplona, Hephzibah, GA 30815

172 TRAILER PLANS Motorcycle, Utility, Car. Construction - Strong. Streamlined, good looking, easily built. Catalog \$4.00 (Refundable). Tag-Along, Box 15107, Salem, OR 97309

STORAGE Buildings. Playhouses. 16 COMPLETE PLANS for \$10.00. Easy instructions. Kempf, Box 88, Toutle, WA 98649-0088.

GIANT Patio Chess Set. 8ft. Square Board. Pieces 18" to 29" Tall, Plans. Full Size Templates. \$10.00. Blackett Designs, 663 East 2800 North, Ogden, Utah 84404

ANTIQUE-style large oak desk w/secret drawer, plans \$7. Enterprise, Box 503, Wilmore, KS 67155-0503

FOR THE HOME

WIRELESS DOORBELL SYSTEM 5 Minute Installation \$59.95 Toll Free 1-800-553-3070.

HOME BUILDING & REMODELING

MAKING Adobe. 34 page booklet, illustrations. \$7.00. Free details. Jamye, 1600 Mockingbird, Azle, Texas 76020

PLASTICS

CASTOLITE Liquid Resins and Molding Supplies to cast, embed, coat, fiberglass, repair and reproduce; in industry, laboratories, craft work. Catalog \$2.00. CASTOLITE, Dept. 87H/PM, Box 391, Woodstock, IL 60098.

PLASTICWORKING, Supplies, plans, manuals, videos. Free catalog. Bewley Associates, Box 7290, Moore, Oklahoma 73153

DO IT YOURSELF

BELT BUCKLES for coins or stones, specialty buckles, jewelry mountings, cut stones, clock works. Wholesale catalog 25¢. Eloxite Corp., 606 1/2 10th Street, Wheatland, Wyoming 82201

ELECTROPLATING. Complete Textbook. Electroplate Metals/Nonmetals. \$11.95. Details Free. Tropix, Palm Bay, FL 32906-0095

BUY WHOLESALE! Parts for Lawn, Garden Equipment, Small Engines, Chainsaws, Minibikes, Karts, More. Includes repair manuals, specialty tools. Send \$4.00 for 184 page catalog. Sav-On-Parts, P.O. Box 45231, Dept P., Somerville, MA 02145

COMPLETE In-ground swimming pool kits from \$1595.00. Free Brochure & Price Lists. Burnett, 341 Hillard Road, North Little Rock, Arkansas 72118.

KITCHEN REMODELING-EUROPEAN CABINETS Ready To Assemble/Install. SAVES HUNDREDS. Layout/Planning Kit \$5.00 (Refundable With Order). Konstrukt-A-Kitchen, Dept. PM106, P.O. Box 640316, Miami, Florida 33164

PVC PIPE FURNITURE Plans, Kits, Material. Free details. Mountain Leisure, Rt. 1, Box 361A-PM, Sautee, GA 30571

ARROWHEAD MAKING!!! Inexpensive Fun Hobby. Free information. Commons Crafts, P.O. Box 5012-M, Central Point, Oregon 97502

ELECTRIC Trolling Motor, Easy/Inexpensive to build. Unique Design. Plans \$4.00. AMAL, P.O. Box 1396, Clifton Park, NY 12065.

AIR condition, refrigeration, home, automobile. Nuts, bolts, troubleshooting, and repair the easy black box method. \$14.95 guaranteed. E. Z. Way, 215 Postoffice Suite 1205G, Galveston, TX 77550.

LAWN MOWER repair made easy. Simple instructions. \$10.00. JW Enterprises, P.O. Box 291, Gresham, Ore. 97030

"SAVE HUNDREDS" on Small Engine Repairs. Basic Upkeep and Principals \$3.00. Tom Cason, 8 "L" St., Lowell, Mass. 01850

REPAIR RUSTOUTS - VCR taped step-by-step instructions to repair rusted autobodys with fiberglass reinforced polyester resins - Send \$14.95 for tape to: How To Tapes Inc., Box 87PM, Malbecott, WV 25871

3-D PHOTOGRAPHY-Inexpensive holography technique! No table, mirrors, lenses instructions \$9.95. Podray's, Box 4653, Clearwater, Florida 33518-4653

(Continued on next page)

DO IT YOURSELF

(Continued from preceding page)

NEW...REPAIR ANY TV...EASY. Write: Research, Rt. 3 Box 601BE, Colville, WA 99114

STOP NEIGHBOR'S LOUD STEREO, FAST! Simple plans, instructions. Legal. \$7. **BAILEY'S**, 424M West Commonwealth, Fullerton, CA 92632

INSTALL YOUR OWN IN GROUND SWIMMING POOL for as low as \$1,895.00. Cheswick Pools, Rt. #28, Cheswick, PA 15024. 412-274-6400

4,321 Catalogs Listed, Sources for Anything! \$5.00. Directory, Box, 92452N, Atlanta, Georgia 30314

SUCCESSFULLY keep dogs off lawns. Learn the trick! Send \$3.00 to: Dogaway, 1576 Kirkway, Bloomfield Hills, MI 48013

ARTS, CRAFTS, SUPPLIES

CLOCK WORKS. Wood clock blanks, rockhound supplies, belt buckles, cut stones, etc. Wholesale catalog 25¢. Eloixite Corp., 806 1/2 10th Street, Wheatland, Wyoming 82201

STAINED GLASS SUPPLIES: EXCITING SUPER CATALOG-PM \$3.00. CORAN-SHOES INDUSTRIES, 509 E. SECOND, BOSTON, MA 02127.

QUARTZ CLOCK MOVEMENTS—digitals \$1.50, epoxy resin \$16.00 gallon, foil prints .95¢, music movements \$1.40, complete clock kits \$8.50, components, plans—much more! 52pg. wholesale catalog \$3.00 (credited). Steebar, P.O. Box 463P, Andover, NJ 07821-0463.

STAINED GLASS Supplies. Complete catalog \$2.00. Sunshine Glassworks, 3690 Harlem, Buffalo, NY 14215

"GETTING Started in Stained Glass." \$1.00. Whittemore, Box 2065T, Hanover, Mass. 02339

CARTOONING, COMMERCIAL ARTS, SIGN PAINTING

CARTOON for Fun and Money!!! Free Booklet!!! Cartoons, Box 40614A, Detroit, Michigan 48240

LEARN Sign Painting, Pin Stripping. Free Catalog. Kaufmann Company, Centertown, Missouri 65023

LEARN SIGN PAINTING. Earn good money. Be job ready in 15 months. Financial and Placement assistance. **ROCKY MOUNTAIN COLLEGE OF ART AND DESIGN**, 6875 East Evans Ave., Denver, Co. 80224. (303) 832-1557.

MODELS, MODEL SUPPLIES

FIRING CANNON Model Plans CATALOG \$2.00. GREEN-PM77, Box 892, Shalimar, FL 32579-0892

RADIO CONTROL Airplanes, Boats, Helicopters, Supplies. Big Discount Catalog \$5.00 (Refundable). Modelers Supply, Box 310P, Eclectic, AL 36024

R/C CARS, BOATS. Latest CATALOG, \$1.00. P.O. Box 204, Queenstown, MD 21658

MAGIC TRICKS, JOKES, VENTRILOQUISM

JOKES/Magic Catalog. 25¢. Garner's, 1085 Fifth NE, Salem, Oregon 97301

FREE! World's Leading Novelty Catalog. 1800 Jokes, Tricks, Science, Sports, Hobbies. Johnson-Smith, F-01, Bradenton, Fla. 34203-3796

LEARN VENTRILOQUISM! Guaranteed Instruction, Supplies, DUMMIES, Information Free! Maher, Box 420-PM, Littleton, Colorado 80160.

PROFESSIONAL Magic! Huge catalog, over 1,000 Tricks and Books, \$4.50. Hank Lee's Magic Factory, Dept. PM7, 125 Lincoln Street, Boston, MA 02111

FREE! Insider Magic Report. **MAGICIANS INTELLIGENCE**, 3380 Sheridan, Amherst, NY 14226

HOBBIES & COLLECTIONS

NAZI & Historical Military Collectibles. FREE catalog. HMA, Box 1806PS, Lafayette, CA 94549.

MILITARY Medals Catalogue \$1.00. Subscription Yearly \$8.00. Vernon, Box 1387PM, N. Baldwin, NY 11510.

"WORKING STEAM MODELS" KITS Or ASSEMBLED. New! Fire Engine Locomotives, Limousine, Roadster, Truck, Marine, Stationary Engines and Accessories. One of the largest stock in North America. Two Steam Books total 68 Color pages \$5.95 (refundable). Colored Circular \$1.00 **LARGE DISCOUNTS.** **DIAMOND ENTERPRISES**, Dept. PM7, Box 337, Alexandria Bay, NY 13607. (613)-475-1771

DECALS, EMBLEMS, PATCHES

CUSTOM EMBROIDERED EMBLEMS, PINS, DECALS. Free Catalog/Quotes. Rush Sketch. Stadri, 81P Jane, N.Y.C. 10014. (212) 929-2293

ANTIQUES, RELICS, INDIAN GOODS & CURIOS

INDIAN artifact books. Free literature. Hotham, Box 458-P, Lancaster, OH 43130.

INDIAN Relics List 50¢. Identification Guide Book \$11.44. Arrowhead Samples \$20.00. Secrist's, Deerfield, MO 64741

STAMP COLLECTING

50 YEARS Old fifteen different United States, over fifty years old-25¢ with approvals. Jaxon, Box C11-P, New Rochelle, New York 10804

CANADA, 25 large, 25¢. World approvals. KSG, Box 651, Nelson, BC, Canada V1L 5R4

BARGAIN mixture \$2.00 (triple \$4.00). Redgrave, 2453 Keystone, Tarpon Springs, Florida 33589.

FREE 25 World Wide Stamps Plus Free Catalogue With Over 2,000,000 Stamps. No Approvals. Jefferies, 3480 Middlebelt, West Bloomfield, MI 48033

FREE 10 triangle stamps! Approvals. Gordon Davison, 307M, Contoocook, N.H. 03229

50 DIFFERENT Old U.S. between 1861 and 1939 - \$1.00. Ed Roush, 423 Shepard, Mansfield, Ohio 44907.

FREE Gift With First Purchase. U.S. Approvals And Want List Service. 20¢ for Handling. The Stamp Boutique, P.O. Box 456, Madison, N.J. 07940

FREE 50 Canadian stamps with approval request. Briner's, P.O. Box 5607, San Mateo, California 94402

OLD U.S. stamps on approval. Sherman, Box 15355E, Philadelphia, PA 19111

"INVERTED ERROR" + 100 Different United States, 50¢ with approvals. Luray, P.O. Box 7088, Silver Spring, MD 20907

UNITED Nations 3 Complete Mint Sets 25¢. Approvals. Cornetta, POB 1509-M, Lake Placid, Florida 33852

COLLECTIBLES, Bird, Duck & Wildlife Stamps & Prints. Free Catalog. Depot, Dept. PS, Sullivan, Ill 61951

200 DIFFERENT Canada \$1.00. Worldwide approvals. Quebephil, Box 88, St-Jerome, Canada J7Z 5T7.

CANADA, 100 different 25¢. Approvals. Droszky, Box 1-C, Sarnia, Ontario, Canada N7T-7H8.

WORLD Wide Stamps mounted in books on approval 2¢ and up. **TRUST STAMP COMPANY**, P.O. Box 100-P, Jamaica, N.Y. 11435

FREE! Surprise Collection with approvals. Gould, Box 750126, Petaluma, CA 94975

ONE! Two! Three! Cent Stamp Approvals, Regardless Catalog. Kloster, 4164 52nd St., San Diego, CA 92105

AUSTRALIA 50 DIFFERENT BEAUTIFUL COMMEMORATIVES 10¢. Approvals. Pence, POB 3041, Winchester, Virginia 22601

FREE Worldwide Packet. Penny approvals. Froehlich, Box 177DA, Pine River, WI 54965

U.S. AIRMAILS, 45 Different used \$2.00, mint \$15.00. Eberling, Box 2216, Neptune City, NJ 07754

FREE The 1966 US Sipek Souvenir Sheet, Mint, is Yours Free With Your Approval Request. Colonie, Box 12113, Albany, NY 12212

FREE Catalog Free! Big Bargain Catalog - New edition listing thousands of bargains including U.S. and B.N.A. stamps, packets albums, accessories and supplies. Also fine stamps from our approval service. Buy only what you like. Return balance promptly! Thank you. Jamestown Stamp Company, Dept. E77PM, Jamestown, NY 14701.

LIQUIDATING Tremendous Old Accumulation. Bargain Lists Free. Alatalo, Maynard, MA 01754

YOU'VE GOT OUR STAMP OF APPROVAL ON THIS! 200 worldwide stamps plus special packet worth \$18.00. Only 50¢! Custom made approvals included. Don't miss out! Order now. R&J Enterprises, 2430 E. Delana, Springfield, MO 65804.

SUMMER CLEARANCE of Discontinued Approval Sets \$30. Retail Only \$10. or \$80. for \$20. Postorama, Box 574, Beaconsfield Quebec H9W 5V2. Free Canada Packet With Every Order.

"AROUND The World Collection" - 109 stamps - only 50¢. Begin the number one hobby of stamp collecting or add to the value of your existing stamps by ordering these truly beautiful quality stamps. Also included will be our big Free Catalog with the latest offers on stamps, supplies, and accessories plus a nice selection of stamps from our approval service. Buy what you like - Return Balance Promptly. Send 50¢ now - Satisfaction Guaranteed. Jamestown Stamp Company, Inc., Dept. T77PM, Jamestown, New York 14701

20 DIFFERENT 4¢ Mint US \$1.00. Free Lists. No Approvals. Robert Wagner, Box 29246, Minneapolis, MN 55429

FREE, U.S. Mint pictorial set complete. Mint approvals included. Hildebrand, Box 4867, Santa Clara, California 95054

BARGAIN 100 World-wide Stamps 25¢. Quality Approvals. R. Parker, Box 143, West Brookfield, MA 01585

FREE U.S. Mint Catalog. Birrell, 2304 Hancock #9C, Austin, Texas 78756

ON APPROVAL Worldwide quality stamps. Reasonable prices. Isham McConnell, Box 47, Bedford, MA 01730

100 Different U.S. 25¢. Approvals. Bradley, Box 425P, Midlothian, VA 23113

250 WORLDWIDE 25¢. Approvals. J. Martin, Box 245, New York, NY 10023

COINS, TOKENS, CURRENCY

FREE foreign \$10 bill. Approvals. MJS, Box 1479, Moose Jaw, Canada S6H 7A8.

BINOCULARS, TELESCOPES, MICROSCOPES, MAGNIFIERS

DISCOUNT OPTICS Bushnell, Steiner, Nikon, many others. U.S.A. Warranties. **FREE** Catalog! Optical Advantage, Box 32791P, Pikeville, MD 21208. (301) 653-3306.

PLAYS, SONGS, MANUSCRIPTS

POEMS, Songs Wanted. Free Recording/Publishing. Broadway Music Productions, Box 7438PM, Sarasota, FL 33578

MUSIC INSTRUCTIONS & INSTRUMENTS

ACCORDIONS, NEW, USED. Electric, electronic. Cordovox, concertinas. Button Boxes. Hohners We Buy. Sell. Trade. Exchange. Repair. Tune. 50 Years Experience If Dealers unavailable. Call or Write for Brochures. MasterCard, Visa And AMEX Accepted. **CASTIGLIONE ACCORDION**, 12644 E 7 Mile, Detroit, MI 48205. 313-627-1595/1-800-325-1832.

PIANOS, PLAYERS, PUMP ORGANS. Rebuild and repair. Catalog of "How-To" books, \$2.00 (refundable). Vestal Press. Vestal 11, New York 13850.

INTERNATIONAL VIOLIN COMPANY, Catalog for instrument makers, repairers. Imported tonewood, tools, varnishes, parts, accessories, strings, cases. European instruments, bows. Assemble yourself violin and guitar kits. Catalog \$1.00 includes 10% discount certificate. Dept. HT, 4028 W. Belvedere Ave., Baltimore, Md. 21215.

INSTRUMENT Kits! Build Appalachian and hammered dulcimers, banjos, mandolins, even harps, harpsichords. Free Catalog. PM Hughes, 4419 West Colfax, Denver, CO 80204

VIOLIN, GUITAR, etc., making materials, accessories, books. Catalog \$1.00. International Luthiers Supply, Box 580397, Tulsa, OK 74158

SELF IMPROVEMENT

ULTIMATE Self Help: Psychic Talisman plus booklet \$10.00. Zoaring, 3502 Brawner, Corpus Christi, Texas 78411

STRESS CONTROL "Fast" "Easy" \$3.50. Research Unlimited, Box 4328PM, Evansville, Ind. 47711

EDUCATION & INSTRUCTIONS

BECOME A PROFESSIONAL REAL ESTATE APPRAISER. Certification From American Society Of Professional Appraisers. Home Study Or Classes. Atlanta, Los Angeles. Instruction By Professionals. Free Information. National College Of Appraisal. 800-223-4542.

HANDLE YOUR OWN LEGAL AFFAIRS. Be a Paralegal Accredited Attorney Instruction. Home Study. **FREE CATALOG.** Southern Career Institute. Drawer 77PM-2158, Boca Raton, FL 33427. (305) 368-2522

OBEY Jesus. Include Acts 2:21-47. Tracts For Printing \$1.00. 1127 N.E. Fifth St., Ocala, Fla. 32670

EXTENSION And Post-Graduate Awards in Philosophy, Art, Science, Botanic, Medicine, Homeopathy, Radionics, and others. 30 subjects Curricular free (airmail \$1.00 refundable). Registrar, Sussex College of Technology, Highfield, Danehill, Sussex, England.

(Continued on next page)

EDUCATION & INSTRUCTIONS

(Continued from preceding page)

RADIESTHESIA, Radionics, Dowsing E.S.P. Courses and Equipment Illustrated Catalog \$1.00 (refundable) Established 27 years. Dept. PM/R, Bruce Copen, Highfield, Danehill, Sussex, England RH17 7EX.

HIGH SCHOOL DIPLOMA AT HOME. NO CLASSES. Low cost. Information Free. Call toll free 1-800-228-5600 or write: American School, Dept. #345, 850 E. 58th St., Chicago, IL 60637

PIANO TUNING PAYS - Piano tuning - Electronic organ servicing. Learned easily at home. Free booklet. Niles Bryant School, P.O. Box 20153, Sacramento, CA 95820

L-EARN Clock Repair, Enjoyable, lucrative. Free Details. School of Clock Repair, 6313 Comeabout Way, Rm. M, Awendaw, SC 29429

AUTOSUGGESTION. Sleep-learning headquarters! Tapes, records, books. Gigantic catalog free. Research Association, Box 24PM, Olympia, Washington 98501.

UNIVERSITY DEGREES By Mail. Accredited Bachelors, Masters, PhD's. Free Facts Revealed. Careers-PM7, Box 470886, Tulsa, OK 74147

LEARN Auctioneering - Free Catalog. Nashville Auction School, Box 2026, D-4, Columbia, Tennessee 38402-2026

EARN MORE IN 90 DAYS. Free 1987 catalogue describes 200 success proven correspondence Diploma courses. Granton Institute, 263A Adelaide Street West, Toronto, Canada M5H 1Y3

DETECTIVE training home-study program. Free information. Global, Box 191 PM, Hanover, Mass. 02339

PARALEGAL GRADED CURRICULUM. Approved in-depth training by correspondence. **BLACKSTONE SCHOOL OF LAW:** 100 years of legal training. Write for free catalog. P.O. Box 790906, Dept. PM, Dallas, Texas 75379

EARN \$45. OR MORE PER HOUR after learning Piano Tuning at home. Accredited member N.H.S.C. Aubrey Willis School, 301 W. Indian School #111, Phoenix, AZ 85013 - (602) 266-1640.

DO YOU ENJOY WORKING WITH CARS? You Can Have A Secure, Good Paying Future in Automotive Electronics. Financial Aid is Available. Call VTI. (713) 956-0010 NOW!

BECOME an Electronic Or Video Technician in only 14 months. Financial Aid, Placement Assistance and an Associate's Degree. Call Now! (214) 263-2613 Dallas. (213) 595-1660 Long Beach, or (713) 956-0010 Houston. VTI

DETECTIVE Profession. Easy Home Study. Free legal pin, certificate, future. Professional Investigator Training School, Dept. CP, P.O. Box 41256, Los Angeles, CA 90041

LOCKSMITHING. Universal School of Master, Correspondence and Shop Training. Box 214652PM, Sacramento, CA 95821

UNIVERSITY DEGREES by mail! Complete directory lists where, how. \$10.00 to: GAB Services, P.O. Box 2245, Tampa, FL 33685-2245

SCHOOLS

WORLD WIDE COLLEGE OF AUCTIONEERING, INC. Since 1933, Term Soon. Free Catalog. **COL. GORDON E. TAYLOR**, Box 949, Dept. 19, Mason City, IA 50401. 515/423-5242.

MERCHANT-Seaman School World Travel, Room Board Tuition Paid. Free Information. 118 14 St. #C, Manhattan Beach, CA 90266

EMPLOYMENT INFORMATION

OVERSEAS Jobs \$20,000 to \$60,000. Free information. Doycorp, Box 6975Z, Pocatello, ID 83201

GET A JOB YOU LIKE! Our self-test and informative handbook help you find work you enjoy. Send \$8.00 to: Career Choices, Dept. ME17, P.O. Box 26614, Rochester, NY 14626.

FARM Edible **SNAILS, HIGH INCOME.** Guaranteed. **FREE** Details. Snails, 4928 Everglade, Rincon Valley, CA 95405

JOBS, CRUISESHIPS, TUGS, SHIPS, RIVERBOATS, OIL-RIGS: Women-Men. Work month-Home month. USA + Overseas. Information \$3.00. Marine Employment, Box 207, Central, IN 47110

CONSTRUCTION - Every trade from laborer to electrician \$19.01 - \$29.85 per hour. There are thousands of positions that are required to pay these rates. We supply the information that most workmen are not aware of to locate these projects. Send \$11.00 to: Carefree Enterprises, P.O. Box 490, Ft. Ord, Ca. 93941

HELP WANTED

OVERSEAS ... \$25,000 - \$75,000+. Free Report! Employment, Box 19760-AT, Indianapolis, IN 46219.

AUSTRALIA WANTS YOU! Big Pay! Transportation! Newest Employment Handbook—\$2.00. International, Box 19107-AT, Washington, DC 20036.

GOVERNMENT JOBS \$16,040 - \$59,230/yr. Now Hiring. Call 805-687-6000 Ext. R-20024 for current federal list.

\$20,000 Yearly Possible. Home preparation available for Post Office Clerk and Rural Carrier employment examinations. Write: Federated-SCB188, POB 16088, Hattiesburg, MS 39402-6088.

FOR INVENTORS

PATENT AND DEVELOP Your invention. Registered Patent Agent and Licensed Professional Engineer. Send for **FREE PATENT INFORMATION** Every Inventory Should Have. Richard L. Miller, 12 Parkside Drive, Suite M, Dix Hills, NY 11746 (516) 499-4343

NONPROFIT Foundation helping inventors over 11 years. Free recording forms. Free evaluation. Affiliated Inventors Foundation, 501-B Iowa, Colorado Springs, CO 80909, or call 1-800-525-5885.

INVENTORS! Can you patent and profit from your idea? Call or write for your free information package. Over a decade of service. **AMERICAN INVENTORS CORPORATION**, 82 Broad Street, Dept. PM, Westfield, Massachusetts 01086. 1-800-338-5656. In Massachusetts or Canada call (413) 568-3753.

PATENT IT ECONOMICALLY! Free Details. Licensed since 1958. N. Raner, 2006 Fondulac, Richmond, VA 23229

INVENTIONS Wanted! **PATENTVESTMENTS INTERNATIONAL**, 1050 Connecticut #300, Washington, DC 20036

REGISTERED PATENT ATTORNEY Reasonable rates. Edwin D. Schindler, 1523 East 4 Street, Brooklyn, NY 11230.

REGISTERED PATENT ATTORNEY Washington, D.C. Suburb. Donald A. Kettlestrings, 414 Hungerford Drive, Rockville, Maryland 20850

INVENTORS: Learn how to submit your ideas to industry. Call free 1-800-528-6050. Canada, 1-800-528-6060. X831.

INVENTION Drawings By Professional Patent Draftsmen. Draftant, P.O. 72, Woodstock, Virginia 22664

DO it yourself method to file your patent, detailed instructions on how to prepare your drawing, abstract, claim, and oath, with illustrations. Send \$5.50 to: D.I.Y., Box 624, Braddock, PA 15104

LEARN how to offer your invention for sale or license. Free booklet outlines procedures, royalty rates, requirements. Kessler Sales Corporation, C-5-F1, Fremont, Ohio 43420

JIGS, TOOLS, VICES. Designed to fit your needs. Dale's Engineering, 800 Jackson, Monticello, IL 61856-2224

INVENTIONS WANTED

INVENTION MARKETING. FREE INFORMATION. REPRESENTING MANUFACTURERS. Patmart, 77 Fulton, 260 Financial District, New York, NY 10038

INVENTORS! Have an idea? Don't know what to do? Call AIM for free information kit. Toll Free 1-800-225-5800

NATIONAL manufacturing/marketing company seeks new products, ideas. Industrial, automotive equipment. 1-800-232-5847

INVENTIONS: Free information on offering your invention for sale. Kessler Sales Corporation, C-5-1W, Fremont, Ohio 43420.

REAL ESTATE & FARMS

UNITED NATIONAL REAL ESTATE ... New **FREE** Catalog! Top real estate values coast to coast. Full Color Premier Properties section. **UNITED** ... For every type of real estate! **UNITED NATIONAL REAL ESTATE**, 4700-PM Bellevue, Kansas City, MO 64112.

CALIFORNIA. Lots. Acreage. \$40 Down. \$40 Monthly. Box 35291, Los Angeles, 90035.

STUDY AT HOME—REAL ESTATE—Secure Your Future in Brokerage or Investment. Professional Course, RGA Diploma. Full Details Write: R.G.A., Box 3132, Station B, Fredericton, N.B. E3A 5G9

CANADIAN COUNTRY PROPERTIES. Acreages for recreation, development, farming, fishing, hunting, investment, minerals, etc. **OUR 72ND YEAR.** Terms available. Titles guaranteed. Catalog airmailed \$1.00. **DIGNAM CORPORATION**, Suite 496, 85 Bloor Street East, Toronto, Canada M4W 1B5

GOVERNMENT HOMES. Delinquent tax property. Repossessions. Call 805-687-6000 Ext. T-20024 for current repo list.

MONTANA LAND 20 Acres (or more) starting at \$6950. with \$500. down, \$98.22/month. Near Beautiful Yellowstone Park and National Forests. In the heart of trophy elk, deer, moose, antelope and turkey hunting. Blue ribbon trout streams. Guaranteed Access. Insured Title And Warranty Deed. Your Inspection Welcomed. Free Color Brochure. **CALL TODAY TOLL FREE: 1-800-252-5283 YELLOWSTONE BASIN PROPERTIES** 1118 N. 7th Ave., Dept. PM, P.O. Box 3027, Bozeman, MT 59772-3027 - (406) 587-5469

FREEDOM COUNTRY

20 BIG acres in **WESTERN MONTANA**, starting at \$9850 ... \$200 down, \$97/month. Trout fishing, backpacking, camping. Elk, deer, moose, bear. **ADJACENT** to National Forests, near established towns. Yellowstone and Glacier National Parks nearby. **GUARANTEED ACCESS, INSURED TITLE, WARRANTY DEED. FREE** color brochure, photos, maps. **FULL MONEY-BACK GUARANTEE.** Call Toll Free 1-800-592-5990. **TREASURE STATE RANCHES**, 210 Milwaukee Street, Dept. PM, Deer Lodge, Montana 59772 - (406) 846-1000.

FREE CATALOGS - FLORIDA, GEORGIA. Homes, Land, Businesses. Please Specify State & Property Preferred. **COUNTRY NETWORK**, Box 368PM, Gainesville, MO 65655-4632. (417) 679-4632

YOUR OWN FISH AND HUNT LAND LOW AS \$39/ ACRE \$50 DOWN!

BEST areas for fish and game. Government report more fish and game per square mile. **TITLE GUARANTEE. BUY-BACK GUARANTEE.** Bought thru **ESTATE LIQUIDATIONS** across Canada. **EASY PAYMENTS.** Get your **FREE** catalog **NOW! CANADIAN ESTATE LAND**, Dept. PM7, 3089 Bathurst Street, Suite 303, Toronto, Ontario M6A 2A4. Phone anytime 1-416-783-3357

OWN A Luxurious Smokey Mountain Retreat, Half Price. Details \$2 SASE. Smokey's, P.O. Box 7096, Evansville, IN 47712

EXPORT-IMPORT

IMPORT Hong Kong, Taiwan, Worldwide. Dirt Cheap. Free Details. Gary Enterprises. 88-1 PM7 Quigley Drive, Scottsville, N.Y. 14546

AMAZING PROFITS FROM HONG KONG PRODUCTS. ORDER SPECIAL TRADE DIRECTORY. SEND \$8.00 NO CHECKS. K. FEE, P.O. BOX 443, FORKED RIVER, N.J. 08731

BUY IT WHOLESALE

FREE 16 page **PRINTING PRICE LIST**, 1 to 5 colors, sheets to catalogs. Copen Press, 100 (PM) Berriman St., Brooklyn, N.Y. 11208.

BELTS, Buckles, Key Tags, Hat Tacs, Jewelry, More. Complete line fast sellers. Big Profits. Complete dealer set up. Color catalog \$1.00 (refundable). Anchor, Box 3958-PMR, North Providence, RI 02911

CLOSEOUT Jewelry 55¢ dozen. (Catalog 25¢). Roussels, 107-1631 Dow, Arlington, MA 02174

WORLDWIDE BARGAINS ... Imports - Dropship - Closeout - Surplus - Freebies - (Stamped Envelope). Marnees, Box 1717PM, Highland, Ind. 46322

EARN MONEY selling rings, jewelry, buckles, watches—buy direct. 130% below retail. Catalog \$1.00 (refundable). Anka-PM, 80 Greenwich Ave., Warwick, RI 02886

400,000 BARGAINS Below Wholesale: Many Free! Liquidations ... Closeouts ... Job Lots ... Single Samples. Free Details. Bargainhunters Opportunities, Box 1409-A, Holland, Michigan 49422.

VACUUM CLEANERS "Discount Prices" New Rainbow \$499.95, Kirby, Filter Queen, Panasonic, Royal, Oreck, Details: ABC Vacuum Warehouse, 6720 Burnet-PM, Austin, TX 78757

FREE BELOW WHOLESALE CATALOGS—500,000 Amazing Bargains Photographed! Exciting Information: Intercontinental, Box 18628, San Antonio, Texas 78218-0628.

REBUILT Kirby Vacuum Cleaners \$249.95 + \$10.00 Shipping, Guaranteed. L. D. Draper & Associates, Box 11, Mitchellville, TN 37118

REPLICA Watches Send \$1.00 for Color Brochure. Prices. J.J.'s Box 73027, Dept. PM7, Houston, TX 77273

CLOSEOUTS! Discounts! Below Wholesale! Freebies! Information/stamp: DDN, Box 20152K, Ferndale, Michigan 48220

(Continued on next page)

BUY IT WHOLESALE

(Continued from preceding page)

BUY Direct Worldwide Bargains Below Wholesale, 500,000 Items. International, Box 150036M, Nashville, TN 37216

ADVERTISING AGENCIES, ADV. SER. MAILING LISTS

NEW NAMES MONTHLY! MIXED STATES AVAILABLE! IMMEDIATE SHIPMENT! Adhesive Labels; Computerized - Guaranteed Opportunity Seekers 200/\$15; 500/\$25; 1000/\$40. Others. **ADVON**, Drawer B2, Shelley, ID 83274. Visa/MC/AmEx 1-800-992-3866

FREE Mailing List Consultation. Details. GOC-41P, Box 1107, Stuart, FL 33494. (305) 334-5205. 1-800-554-5478

OPPORTUNITY SEEKERS/MLM NAMES. FREE SAMPLE. Venture-LP, Box 336, Riviera, AZ 85442

HOT list - many categories. Credit card orders 1-800-843-0755/1-515-232-6789. List, Box 1033, Ames, IA 50010

NAMES! FRESH, HOTLINE, DELIVERABLE LABELS! GUARANTEED! QUALITY PRICES! 1-800-992-9405.

FRESH HOT NAMES! OPPORTUNITY SEEKERS. Peel/Stick Labels. Zip Coded. **GUARANTEED DELIVERABLE!** 500/\$20; 1000/\$35; 2000/\$60. JR Enterprises, 809 Briarwood-PM7, Victoria, Texas 77904

COMPUTERIZED LISTS. BUYERS MANY CATEGORIES. Peel/Stick. Guaranteed Deliveries. Low Prices. 200,000 Names Monthly. Fast 1st Class Mail Return. Free Price And Ordering Brochure. Eva Lists, Dept. 203, Box 6061, Torrance, CA 90504

HIGH QUALITY Mailing Lists, guaranteed deliverable, send for **FREE** details. Marshall Gilbert Co., P.O. Box 12925, Seattle, WA 98111

MAILORDER BUYER'S LISTS-computerized peel/stick labels. Zip code order, rush SASE to: Mar-Con, Box 5518, Clark, NJ 07066

CASH PAYING OPPORTUNITY SEEKERS! FREE INFORMATION FAST! G.A. LISTS, 5686 La Jolla Blvd. #317A, La Jolla, CA 92037

RESPONSIVE Opportunity Seekers Names! Free Sample! SASE: The Mail Lists Factory, Dept. O, 320 N. Plymouth Blvd., Los Angeles, CA 90004

GREAT MAILORDER NAMES! EXCELLENT LISTS OF RESPONSIVE BUYERS IN ALL CATEGORIES. Deliverability guaranteed. E-Z labels ZIP CODED BY COMPUTER. For full details rush SASE to: Yarchin, P.O. Box 893, Claremont, CA 91711.

COMPUTERIZED mailing list. Free categories and price lists. Barnes Distributors, Box 208, North Rose, New York 14516

BUSINESS SERVICES

RETAIL STORE SELECTION. Professional methods for finding, evaluating, negotiating your **RIGHT** location. Booklet \$5.00. Progress, 46 Stamford Square North, Scarborough, Ontario, Canada, M1L 1X6

INCORPORATE without legal fees! Free booklet tells how. Includes forms. Call Harvard Business Services, now 800-345-CORP.

ACTIVE Buyers Mailing Lists. Opportunity Seekers Discounts All Categories. SASE. Ark, Box 234, Inlay, Mich. 48444

PRINTING PRESSES, RUBBER STAMP OUTFITS

TYPE Fonts, Hand Printing Presses. Hot Stampers. Supplies. 120 Pages. \$2.00 Deductible first order. Acme Type, 1720 N. Marshfield, Chicago, 60622

MAKE rubber stamps—big profits. Complete supply and equipment catalog with instructions. \$1 deductible with order. Star Stamp Supply, 1720 N. Marshfield, Chicago 60622

TYPE for printing. Catalog \$1.00/deductible 1st order. Quaker City Type, R.D. 3, Box 134, Honeybrook, PA 19344

PRINTING Presses, new and used supplies. List 50¢. Tumbaugh Printers Supply, Mechanicsburg, Penna. 17055

BARCO Type Founders. Type and Rubber Stamps catalogue. Mail \$2.00 refundable on first order. P.O. Box 1011, Bensenville, 60106

PRINTING SUPPLIES

QUICK Copy Printing. Low Prices. Write: Nationwide, 614 North Main, Bloomington, Illinois 61701

GIFT SHOPPING

DISCOVER The World of Gifts International. An Adventure in Shopping That's Pure Fun! Send \$1.00 for Catalog to: Gifts International, Box 1858, Hialeah, FL 33011

CLOCKS, WATCHES, OLD GOLD, JEWELRY

HIGHEST CASH for Gold, Jewelry, Gold Teeth, Rings, Diamonds, Watches, Silver, Platinum. Mail Articles Today. Free gift with information. Chicago Gold & Precious Metals, 10 South Wabash, Dept. 1158, Chicago, 60603

TAKE NO CHANCES. Deal with oldest, most reliable firm in old gold business. Established in 1934. We buy Gold, Silver, Platinum, Diamonds, Highest Cash, Free Information. Rose Industries, 29-A East Madison, Chicago 60602

CLOCKWORKS, wood clock blanks, rockhound supplies, belt buckles, cut stones, etc. Wholesale catalog 25¢. Eloxite Corp., 606 1/2 10th Street, Wheatland, Wyoming 82201

CLOCKS, MOVEMENTS, ACCESSORIES (German). Free catalog. 1-800-558-2674. Instruments Services, Dept. PM, 433 So. Arch, Janesville, WI 53545

LOWEST PRICES paid by you for first quality diamond jewelry. Guaranteed. **FREE** color catalog. Diamond Limited, Box 66, Dept. 12, Granger, IN 46530. (219) 295-3844

CLOCKS Made, Mantel, Bracket, Banjo, Grandfather - Information. Box 2654, Ann Arbor, Michigan 48106

SWISS WATCH REPLICAS! Wholesaler! Exact Details! Warranty! "July 4th Special!" (404) 983-3USA.

TREASURE FINDERS

TREASURE—Locate quarter mile away with ultra sensitive locator—brochure free. Research Products, Box 270270-AMC, Tampa, Florida 33688

SAVE up to 40% on metal detectors. All major brands including White's and Garrett. **FREE** discount catalog. Northwoods General Store, Dept. DPM7, 1325 Greenway Cross, Madison, WI 53713. (608) 274-4680

TREASURE Locators Ancient and Electronics. Most Complete Line. Free Catalog. **DETECTORES**, P.O. Box 17129, Dallas, TX 75217

PROFITABLE OCCUPATIONS

FREE Information Starter & Alternator Rebuilding. Box 422, Seymour, TN 37855

PLASTERCRAFT ... Profitable Home Business 3000 Molds Available. Details. Lynnette, 5251C Mentpark, Mentor, Ohio 44060

FREE Brochures. Repair air conditioning, Refrigeration. Tools, Supplies, full instructions. Doolco, Inc., 11252 Goodnight, Dallas, TX 75229

FT. SMITH Auction School. Ft. Smith, Ark, 72903. Resident & Home study. Veteran Approved.

MAKE \$1000 WEEKLY DETAILING AUTOMOBILES! Legitimate satisfaction guaranteed. Info: Gnopubco, Box 61291, Oklahoma City, OK 73146

REPAIR lawnmowers thousands of parts and tools wholesale list 50¢. Ellwanger's, PM, P.O. Box V, Port Jervis, NY 12771

SALESMEN-DIST.

MAKE EXTRA MONEY DURING YOUR SPARE TIME! Earn weekly commissions showing our exciting line of Calendars, Pens and other popular Advertising Gifts. Prompt, personal service from AAA-1 firm. Our 78th year. No experience necessary. No investment or collections. Set your own hours. Full Time Potential! Write to Kevin Peska, **NEWTON MANUFACTURING COMPANY**, Dept. EPMC7, Newton, Iowa 50208

AGENTS WANTED

DISTRICT MANAGER TRAINEES! Home educational programs. Earn \$239.00 each sale, plus crew bonus money. No door to door selling. DTH, POB 214036, Sacramento, CA 95821

WITH Mason Shoes, pay day is when you want it! Take orders from friends and neighbors. Watch your business build, without risk or investment. Call Toll Free 1-800-826-7030. Ask for Ext. K-436. In WI 1-800-472-7003. Ask for Ext. K-436, or write Mason Shoes, K-436, Chippewa Falls, WI 54774.

MAKE MONEY IN SPARE TIME. As a subscription sales representative for leading national magazines, you can earn generous commissions while learning the art of selling. Instructions and supplies will be sent to you free. Send this ad with your name and address to: **POPULAR MECHANICS**, Dept. AB-L, 250 W. 55th St., New York, NY 10019

BUSINESS OPPORTUNITIES

IMPORT-Export opportunity, profitable world-wide, mail order business from home, without capital. We ship plan for no risk examination. Experience unnecessary. Free Report. Mellinger, Dept. A2709, Woodland Hills, California 91367

EARN Thousands! Home Mailing Program. Goodworld, Box 26233-R, Tamarac, FL 33320

GUARANTEED! \$1.00 Pound from "Junked" tires! (Send Stamp). LeValleys, Fountain, FL 32438

START MONEYMAKING WOODCRAFT BUSINESS making "Easy - Quick" toys, gifts, novelties. Free details. **WILLIAMS**, 3600L San Sebastian, Tucson, AZ 85715

SHORT CUT TO EASY STREET REVEALED! Profitable home business. Free information. Dickinson-PM787, Box 37775, Milwaukee, WI 53237-0775

INCREASE Your Income! Arrange loans, leases, other financial services through nationwide lender network. Prestigious money business, full/part-time. Top Commissions, complete training, continuous support. Free details by electronic mail! PFA, Box 697-P, Dana Point, CA 92629. (714) 240-0405 X100-P

EARN WHILE YOU LEARN. Repair Hydraulic Jacks. Free Details. Hydraulic Jack Inc., Dept. PMC3, P.O. Box 18, Accord, NY 12404

EARN MONEY REGROUTING BATHROOMS. Earn \$30 to \$50 per hour. Write for **FREE** "How to Make Money Regrouting Bathrooms" booklet. Sample regROUT kit \$16.95. Benissa Sales Inc., 114 East 32 St., Dept. B, New York, NY 10016

LEARN Gold, Silver Scrap Recycling Business. Free information: Recycling, Box 11216P, Reno, NV 89510-1216

EASY \$30,000 - Part Time. As a Printing Broker. **FREE INFORMATION.** Shortcuts, Box 9445, Elizabeth, NJ 07202-0445

START your own profitable business at home. Write for **FREE** details. Robert Mark, 416 Roosevelt Road, Box 362, Bemidji, MN 56601

\$40,000 ON 1/2 ACRE! New Hydroponics - inexpensive, pleasant, practical! Free information. Robin's, Box 1214, Franklin, TN 37065-1214

VINYL'S Where the money is! Professionally repair, refinish, recolor furniture, car tops. Quick, easy. Two small \$20 jobs a day earn you \$1,000 a month. Homes, cars, offices, restaurants, unlimited customers. Start earning after a few days practice. Details free. VIP, 2007 Montrose, Chicago, 60618

RECYCLE METALS. NO, NOT BEER CANS! Easy \$458 weekly! Free information. Recycler, Box 1214, Franklin, TN 37065-1214

TAKE Catalog Orders. We drop-ship 2955 best selling specialty products. Lowest below wholesale prices. Immediate delivery. Spectacular home business opportunity. Free Book. SMC, 9401 De Soto Avenue, Dept. 20-79, Chatsworth, CA 91311-4991

MAILORDER Books, 1,000% Profit Report. Selective, Box 1140, Clearwater, FL 33517

MAKE BIG MONEY REPAIRING WINDSHIELDS & Plate Glass! Up to \$60,000 yearly! Call **TOLL-FREE** for Valuable **FREE** report. 1-800-321-2597. Glas-Weld Systems, Box 575507, Bend, OR 97708

\$1,000 weekly mailorder. Immediate opportunity. No obligation. Enterprise, 210 Welch-PM, Ames, IA 50010

CONCRETE Block Machines. Catalog \$1.00. Route One, Box 3740, Rapid City, South Dakota 57702-3740

REPAIR HYDRAULIC JACKS—DETAILS FREE. WRITE: HYDRAULIC PARTS SUPPLY, BOX 4157, BROWNSVILLE, TEXAS 77820.

VENDING MACHINES. No selling. Routes earn amazing profits. "Big Catalogue **FREE**." Parkway Corporation, 1930 PMB Greenspring Drive, Timonium, Maryland 21093

LEARN Sewing Machine Repairing. Men, Women. Lucrative Profits. Gresslin Correspondence School, Box 5104, Spencer, Iowa 51301

(Continued on next page)

BUSINESS OPPORTUNITIES

(Continued from preceding page)

PREPARE Tax Returns. Earn high fees, dignified work. Train at home. Accredited Program. National Tax Training School, Monsey, 2GU, New York 10952.

EARNINGS unlimited! Mail our burglar alarm advertisements from home! RBM Merchandising, Box 59314, Chicago, IL 60659

\$1,000 Weekly. Home Business Directory, Box 2019-PM, New York, New York 10163

\$192.00 From Square Foot Plywood. (Huge Demand) Revealing Proof 50¢ (Refundable). Woodwin, Bridgewater, Mass. 02324

NEW discovery in battery reconditioning. Eighteen months guarantee means "Big Profits Fast"! Electone, 7415 Gable Dr., Little Rock, AR 72205

ASSEMBLE wooden novelties at home. We pay **\$232.88** weekly. No experience. SASE. Walpine, Box 660M, Pinellas Park, FL 34290-0660

ALUMINUM SCRAP — Recycle Yourself — **MAKE \$25.00/POUND!** Free Information: Industrial-PM77, Box 127, Alexandria Bay, New York 13607

EXTRA INCOME. Assemble products at home. No experience. Details. 1-813-545-8421. Ext. 698.

MULTI-Level Mailorder. Two Opportunities. O'Neil-M, 10 Oak Lane, Suisun, CA 94585

LEARN MIRROR RESILVERING free information. Silvercraft, Box 127, Lansdowne, PA 19050.

BATHTUB REGLAZING, product sales, service and training. Call Unique Coatings Corp. (313) 538-8600.

BUMPERSTICKER PRINTER. Cheap, Simple, Portable. Free Details. Bumper, POB 22791 (GC), Tampa, FL 33622.

MAKE Rubber Stamps. Highly Profitable. Free Details. **STAMPER,** P.O. Box 22609 (GC), Tampa, FL 33622

SCREEN PRINT T-SHIRTS. Inexpensive kits. Free Details. T-Printer, P.O. Box 23891 (GC), Tampa, FL 33623

MAKE BALLOON ANIMALS. \$400 Weekends! **FREE SAMPLES/INSTRUCTIONS:** Funnyman's - PM77, Box 250, Alexandria Bay, New York 13607

ASSEMBLE PRODUCTS AT HOME. Many opportunities paying High Weekly Profits presently available without investment. Write: Businesses, 92B Brighton 11th, Brooklyn, New York 11235

\$10,000 MONTHLY Taking Photographs at Home! Call recorded message: (303) 674-8155

ASSEMBLE Electronic parts. We supply components and instructions. No experience, no selling, guaranteed payment. Write: SouthTech Electronics, Box 28217P, Kenneth City, FL 33709

UNLIMITED INCOME GUARANTEED! Seven Most Profitable Home Businesses! Easy To Start, Low Investment! Free Information: Pollard Enterprises, 2581-PM4 Country Wood, Greenville, MS 38701.

NEW OPPORTUNITY! Learn Telephone Service And Repair At Home. **AVERAGE \$35.00/HOUR.** Free Brochure. Setcomm. 2186-K Collins Blvd., Gulfport, MS 39507

MAKE PVC FURNITURE. Turn your spare hours into \$31,200 yearly! Easy home assembly business. Write: PVC, 771PM, Battle Ground, Washington 98604

MAKE YOUR DREAM COME TRUE. EARN \$60,000 YEARLY REPAIRING SMALL CRACKS IN WINDSHIELDS NOT REPLACING THEM. CALL TOLL FREE 1-800-826-8523 OR WRITE: THE GLASS MECHANIX INC., BOX 17893, PLANTATION, FLA 33318

HUGE PROFITS - Making Planters-Growing Herbs. Write: Planters, P.O. Box M421, Brush Prairie, WA 98606

FIRST USA OFFER. \$10 wood into \$480 quickly, easily. **VERY LARGE MARKET** - can be done **IN THE HOME!** Details \$3. A.G., Box 206, Belleville, Ontario, Canada. K8N-5A2

FREE DEALERSHIP - SELL MAILING LISTS! Grab your share of the Big Profits in this Multi-Million dollar industry! Complete program free! PCW, Box 1302PM7, Valley Stream, NY 11562

14,847 HONG KONG-TAIWAN Products Cheap. Small lots. Some samples free. Harbor, Box 1719PM7, Yuba City, CA 95992

FREE LIST! U.S. And Foreign Suppliers. Belli, Box 1182, St. Albans, W.V. 25177

FREE \$10.00 BOOK! "Make \$400 Daily Selling Books By Mail." Profit, 6361 Vickers, #304PM, San Diego, CA 92111

HIGH SCHOOL DIPLOMA AT HOME, NO CLASSES. Low cost. Information Free. Call toll free 1-800-228-5600 or write: American School, Dept. #345, 850 E. 58th St., Chicago, IL 60637

\$1,000 weekly. Repairing Air Tools. Instructions. Parts and Tools Wholesale. Free Details. Box 534, Wichita Falls, TX 76307.

PROMOTE 500 everyday necessities. No overhead - selling optional. Established company. 2747 Del Medio, 209C, Mt. View, CA 94040.

\$1,000'S WEEKLY!! MAILING FROM HOME! Immediate opportunity! Century Publishing Company, Box 2659PM, Danbury, CT 06813

RECONDITION BATTERIES! Easily Earn Hundreds Weekly. Untold Secrets. Free Information. Battery Outlet, Box 3300M, Hickory, N.C. 28603.

\$1,000 WEEKLY Possible Bronzing Baby Shoes **FREE BROCHURE SHOWS HOW.** NBPM, 398 Airport, Sebring, FL 33870

NEW PRODUCTS NEWSLETTER. Exclusive opportunities. Free information. International. Box 636PM, Newark, NJ 07101

GET RICH! Ancient **SECRET** Revealed! **YOU CAN** Have Unlimited Wealth! Details **FREE!** JC Associates, 2713 Soapstone Drive, #100, Reston, VA 22091

ANYONE CAN MAKE MONEY WITH A CAMERA! New Report Reveals Facts. Much Information. Guaranteed. Rush \$3.00 Today! PGU, Dept. 100, 415 Country Meadow Dr., Mansfield, TX 76063

MILLIONS in mail-order? You betcha. Info \$1.00. Trillium Entl., Box 307, 5699-201A St., Langley, B.C. Canada V3A 1S9

MAKE MONEY AT HOME, several high profit, easy businesses. Free information. P.O. Box 13252, Arlington, TX 76094-0252

HOW To Start And Operate 7 Profitable Businesses At Home. Great Information. Free. GM Business Consultants, 142 PM Westgate Drive, Edison, NJ 08820

MAKE MORE MONEY, work less, **BE YOUR OWN BOSS.** Ideal work - at home in your garage or shed. Manufacture Fiberglass canoes. Easy one or two man operation. Earn \$300 to \$1500 each week. Full or part time operation. Low investment for **UNIQUE EASY TO USE MOLD,** model canoe, booklets on where to get supplies, how and where to sell your canoes and general Business tips. Send for full information. Write: E-Z Tool Co., 30 North Road, Bedford, MA 01730.

\$15,000 MONTHLY Income! Easy Money-making Plan. No Investment! McDowell #M-7, 3660 Wilshire, Los Angeles, CA 90010

ELECTROPLATING Rebuilding Alternators Batteries. Catalytic Concretecrafts, 31255 Blueskyway, Castaic, California 91310

NEW Opportunity. Learn Transfer All Photograph, Prints to Canvas As An Original Painting. P.O. Box 3904, Laguna Hills, CA 92654-3904

HOW DOES \$9,000. A MONTH SOUND? Writing Workbooks & Manuals, We'll Tell You How & What. Send \$9.85. (Guaranteed) To: Shenandoah Heartley Publications, Box 1109, El Mirage, AZ 85335

INVENTION: 100% Sale. Field Tested. Ready for Marketing. Includes Drawings, Tooling. (NH 1-603-336-5539).

15 SUCCESSFUL Home Based Businesses. Start for \$200 each! M-K Products, P.O. Box 236, Ashtabula, Ohio 44004

MAKE MONEY - be INDEPENDENT - NEW HOME BUSINESS KIT tells how **HUGE PROFITS** free details. Toe Publications, Rt. 6 Box 656pl, Mankato, MN 56001

FREE! Selection of Home Businesses. Clifford's, 130 E. Main, Suite 285C, Medford, OR 97501

\$100,000 A YEAR! Small investment, pleasant clean work-raising worms! Free information. Riverview Publishing, Rt.6 Box 658, Mankato, MN 56001

STEADY INCOME. Service cutlery. Simple business-low investment. Ed Liebling, 6305 Westward #109, Houston, Tx. 77081

HOME BUSINESS OPPORTUNITIES Guaranteed way to your own profitable business! Proven programs, Free details. Midwest Communication, Box 5139, Morton, IL 61550

EARN \$75,000+ PER YEAR

REPAIRING damaged windshields, not replacing them! For **FREE** information package call **TOLL FREE 1-800-STAR 44** or write: Orion, 3375 Park Avenue, 2000A, Wantagh, NY 11793.

\$40 - \$108/HOUR. Amazing breakthrough process restores Burned/Cut/Damaged Countertops **WITHOUT REPLACEMENT.** 2 hours/day earn \$30,000/year. Millions of apartments, homes pay profits immediately! Free Information. **RENEW,** Box 9900, Vancouver, WA 98664

ARAB BUSINESSMEN have money to buy & invest. Top finders fees paid. IMEA, 787PM1 Box 3574, Newport Beach, CA 92663

\$MILLION SALES AWARD WINNER PRESENTS MONEY-MAKING HOME MAILORDER. No risk examination! Bonuses! Free Details. SASE: Maxamillion, Box 74-PM, Buffalo, NY 14221

PROFITABLE GOLD FOIL PRINTER. Personalize business cards, pencils, matches. Free details. Gold, P.O. Box 24986 (GC), Tampa, FL 33623

57 MONEYMAKING HOME BUSINESSES. Start profitable home business without experience or capital. Send \$2.00: Houston, 5 Ruemax Suite A, Pensacola, FL 32507

SWIMMING POOL CONSTRUCTION Sell & install Vinyl Liner In-Ground Pools Full Time Summer or Year Round 1-800-428-3254 For Free Information.

TIRED of money-making ideas that don't work? This one does! Free information. Brant Consulting, Box 8027, Williamsport, PA 17701

HOW to start and operate your own Profitable Business at home, big income opportunity guaranteed, free details. Write to: S.H. Enterprises, 25859 S.W. 132 Pl., Miami, FL 33032.

5,001 Money-making Opportunities! Free Catalog! Dynamics, Box 18039G, Akron, OH 44305.

FLEA Market Profits, Free Report: O'Donnell's, 9PM Sewanols, Lincoln Park, New Jersey 07035

WANT TO GET RICH? Discover Money-making Success Secret! Write: Blessings-J1, Box 580, Kissimmee, Florida 32741

82 CURRENT Money making reports, manuals. Re-print right available. Free information. Lawrie Enterprises, Inc., 943-S New Street, West Chester, PA 19382

START A Mailorder Business! Free Subscription to Newsletter Shows How. Write: Image, 2458 Lomita #112-PM7, Lomita, CA 90717

SELL books by mail. How-to, self improvement books. Illustrated catalog, over 500 titles. Complete start-up package. \$3.00. Hanchey Books, 3-B182-A, Wallace, N.C. 28486

MAIL ORDER RICHES Selling Books! Free Details. Associated-J, 395 Westchester Avenue, Port Chester, NY 10573.

ATTENTION-Opportunity For Financial Independence!! Money Back Guarantee!! Introduce people to buyers service. Rush \$10.00. To: Buyers, 910 E. Pratt, Palatine, IL 60067

LEARN NEON. Vital, expanding industry. **SELF-TAUGHT.** Complete course, \$35 (US) Details free. Write, **NEON COURSE,** POB 244 Stn-T, Calgary, AB. T2H 2G8

MONEY in used appliances, working or not! Easy to find - many free. Sell to retailers or public for high profits. Experience unnecessary! Long time appliance dealer shows way to success. \$7.00. Appliance Recyclers, 128 Commerce, Johnson City, TN 37604

IMPROVED EYEGLASS FRAME for easier carrying. Clip-on frame - no case needed. No bulge - firmly fastened. Lenses protected. Patent/leasing rights offered. Box 148, Huntington, NY 11743

SEIZED IN GOVERNMENT NARCOTICS RAID! Automobiles ... Vans ... Boats ... Furniture ... Thousands other items. Buy Dirt Cheap—Resell for Big Profits! Free information. Marcel, Box 7557-M, Monroe, LA 71211

\$500/WEEK washing windows! Send \$5 for "how to" "start-up" guide to: Marcoux, 6024 Queenston, Springfield, Virginia 22152

\$5000/Month-Free Information - No Obligation - Longa, Box 1465, Garden Grove, CA 92642 - 714/638-2167.

EARN THOUSANDS WITH YOUR OWN ELECTRONICS BUSINESS. 1 Do. Free Proof, Information. Industrial, Box 531, Bronx, NY 10461

FREE Starters Kit! Increase Your Income. No Purchase/Inventory Required. Home Businesses, 1484 Iverson, Atlanta, GA 30307

(Continued on next page)

BUSINESS OPPORTUNITIES

(Continued from preceding page)

NEED QUICK MONEY? End worry. Easy Spare time. Free details. CFO/A, Box 1011, Wilcox, Arizona 85644

MAIL ORDER Bookselling Dealership! Free Details! Deceno, Ltd., Box 20315, Reno, NV 89515

HONG KONG, TAIWAN Products Cheap. Free Details. Write: Delta Publications, Box 230, Indianola, Miss. 38751

105 Ways To Make Money At Home \$2.00. Box 45181, Little Rock, Ark. 72214

EASY BUSINESS! Earn \$1,000's Weekly. Free Details. Write or send stamped addressed envelope. Toddco, Dept. PM, 4219 West Olive Ave., Burbank, CA 91505.

\$200 Profit Daily With Your Own Professional Housecleaning Service. No Investment. Details. Westfield, Box 83P, Middleton, Wisconsin 53562

HOW TO BECOME A BUSINESS TYCOON. You be the Boss. First time secrets revealed. Free Information. Lawrie Enterprises, Inc., 943-S New Street, West Chester, PA 19382

MAKING EXTRA MONEY MADE EASY. FREE Subscription to Opportunity Magazine offers hundreds of proven ways. Write: Opportunity, Dept. J98, 6 N. Michigan Avenue, Chicago, IL 60602.

\$25,000 LOANS INTEREST FREE!! Secret Federal law WIPES OUT DEBTS!! Details FREE!! Moneywise/B, Box 636679, Margate, FL 33063

LOCATE HEIRS and make big money. Complete course: \$14.50 plus \$1.50 postage and handling: Haley, P.O. Box 1573, Gardnerville, Nevada 89410

CLIP newspaper items—\$2 - \$25 EACH!! FREE Report! Clippings/B, Box 6109, Pompano, FL 33063

GET RICH!! Secret law smashes debts—brings Cash. Credit! FREE report!! WealthKit/B, Box 4036, Pompano, FL 33063

FINANCIAL EASY STREET Your POSSIBLE DREAM. Free Details. Stephen Sisco, 6654 Winchester, Suite 168, Memphis, TN 38115

GET RICH using OTHER PEOPLE'S MONEY!! Unique - amazing business!! Details FREE!! Finance/B, Box 4605, Margate, FL 33063

BE INDEPENDENT! Mailorder book business growing fast. Free information. ALEXANDRIA, Dept. M77, P.O. Box 723, Jacksonville, IL 62651

1,300,000 millionaires can't be wrong! Start your own business! Wealth Builder, Box 10286P, Oakland, CA 94610

PIANO Tuning learned quickly at home. Free information. Empire School, Box 1014PM, Jupiter, FL 33468.

RIGHT PRODUCT costs 25¢ to produce! Sells like hot cakes for \$10!! Free information. BNP, Suite 18-270G, 12416 North 28th Drive, Phoenix, Arizona 85029.

THE LONG LINE DOWNLINE does it all! Free, no recruiting, co-op advertising. Send LSASE, LLD-1, Drawer 31, Patchogue, NY 11772.

GET RICH AT HOME: Brand-new with exhaustively documented proof: Weber, PM7, Box 93, Eureka Springs, AR 72632

TRIAL Subscription Absolutely free. Send name, address, zip to: Spare Time Money Making Opportunities Magazine, Dept. C-17, 5810 W. Oklahoma Ave., Milwaukee, WI 53219

MAKE MILLIONS MANUFACTURING BATTERIES!! Supplies available. Everlast, Box 365, Bogota, NJ 07603

FULL-Flash—Part-Time \$180 Per Roll Guaranteed Taking Photographs. Experience Unnecessary 35MM Camera and Film Supplied Free. 1-416-482-2100 X1907 Days/Evenings/Weekends.

MONEYMAKING OPPORTUNITIES

HIGH Profits T-Shirts And Caps. Inexpensive, professional transfer machines, supplies. Press Magic, P.O. Box 22809-(GG), Tampa, FL 33623.

\$1,000'S Working Home. Rush Stamped Envelope: Allstars, Box 691809, Los Angeles, CA 90069

GET THOUSANDS OF BOOKS, CATALOGS, Money-making Offers, for only \$3.00. SHORTCUTS, Box 9445MGG, Elizabeth, NJ 07202

FANTASTIC earnings mailing from home!! Offer: Rush Stamped Addressed Envelope, Imperial, P-8 X17410, Fort Lauderdale, FL 33318

MAKE Rubber Stamps. Highly Profitable. Free Details. STAMPER, P.O. Box 22809 (GG), Tampa, FL 33622

MONEY From discarded tires! Details. Brownie, Box 53, Fishers, Indiana 46038

EVALUATE "Money-making" Opportunities! Avoid Scams, Ripoffs And Losers! Complete Report \$9.95! Details Free! SeaBert Associates, 1205-A Prospect Dr., Stratford, CT 06497

\$\$\$! Free Membership. Free Details!! Allbright, Box 295-A, Pike, N.Y. 14130

\$15,000 MONTHLY Income! Easy Money-making Plan. No Investment! McDowell #MQ-7, 3660 Wilshire, Los Angeles, CA 90010

STAY HOME AND MAKE MONEY, OUR BOOK SHOWS HOW. FREE DETAILS. CROWN THORN, BOX 2067, STAMFORD, CT. 06906

WIN At Horse Races Details \$2.00. Ponies for Prosperity, 2408 Leavenworth, Omaha, NE 68105

NEW! 21 BUSINESSES. Start cheap, build fast, restore independence. Pierce, Box 1730, Lewisville, TX 75067

FREE DETAILS Best book available on starting any of 7 proven most profitable home businesses. Write: Carroll Publishing, Dept 68, 429 Littleton, W. Lafayette, IN 47906

EARN \$5,000 ANY WEEKEND! Amazing new system makes it easy. No money needed. Skeptical? FREE PROOF. Write: Crossroads, Box 5097-C9, Babylon, NY 11707

HOW TO START AND OPERATE YOUR OWN PROFITABLE BUSINESS AT HOME, FREE DETAILS, SEND SASE. KING ENTERPRISES, P.O. BOX 302, MESA, AZ 85201

PICK Profitable Home Business You Prefer. Dozens Described. Free report. Success Group, Box 622, Midway City, CA 92655

LOOK! MONEY making craft. Chip carve beautiful wooden items. Order "Chip Carving Made Easy." \$3.00. Chip Carving-PM7, 1521 Ave. B., Gothenburg, NE 68138

BUMPERSTICKER PRINTER. Cheap, Simple, Portable. Free Details. Bumper, POB 22791 (GG), Tampa, FL 33622.

OUT OF WORK? Now available wholesaling opportunities. Start at home spare time, immediate profits. Send for application. Homemakers, 22 Glade, Jacksonville, AR 72076.

STARTING YOUR OWN BUSINESS. FREE Subscription to Opportunity Magazine tells how. Write Opportunity, Dept. J99, 6 N. Michigan Avenue, Chicago, IL 60602.

99 MONEY Making Mail Order Ideas Very Profitable. Proven Methods! Detailed Manual. \$29.95 Postage Paid. Information Send SASE. Monex, Box 1507, Kearney, NE 68847

GET RICH!! Secret law smashes debts—brings Cash. Credit! FREE report!! WealthKit/B, Box 4036, Pompano, FL 33063

THINK A Billion. Information \$1.00. Roddy, DSR 14pm, El Campo, TX 77437-9232

HOME BUSINESSES DO MAKE MONEY! Seven amazing home businesses. Guaranteed unlimited income. Free information. Pleasantview Book Co., Dept. 1, 3 Pleasant Ave., Amsterdam, New York 12010

MONEY Learn My Secret. Become Rich. Satisfaction Guaranteed. \$5.00. Peggy Flowers, Dept. PM, 1303-A Hwy. 70 East, New Bern, NC 28560

ADVERTISE Free in 507 Magazines. \$5.00. Directory, Box 11N, Atlanta, Georgia 30301

MAILORDER OPPORTUNITIES

MILLIONAIRE Mailorder Expert Reveals Money-Making Secrets. Free, Exciting, Hour Cassette: Mel Powers, No. Hollywood, California 91609.

FREE Details How To Start And Operate Your Own Profitable Business At Home. ACT Marketing, 5915 Fairway Dr., Hope Mills, NC 28348

HOW To Sell Information By Mail. Send \$8.95 to: Whitecliff, Box 68265, Dept. PM, Schaumburg, IL 60168

HAVE you a great idea, a fantastic plan or a very interesting project? Why not put them to work for you! Classified Advertising can be of tremendous value in promoting all these things and more. Learn **HOW TO MAKE MONEY THROUGH CLASSIFIED ADVERTISING** by sending away for **POPULAR MECHANICS PROFIT BOOK**. Price \$1.00. Send to: PM Classified, 224 W. 57th St., New York, NY 10019

RABBITS-CHINCHILLAS-FUR BEARING ANIMALS

GUARANTEED INCOME. Raise Chinchillas. Send \$10.00 (refundable) to: Chinchillas, Dept. B, P.O. Box 7463, Mesa, Arizona 85206.

OF INTEREST TO ALL

PRICE BREAKTHROUGH! Luxury Business Cards \$7.50/225. \$12.50/500. \$13.95/1,000. **FREE CATALOG.** Shortcuts, Box 9445, Elizabeth, NJ 07202

FREE PRIVACY CATALOG. Cash income opportunities. Hiding assets. Secret loans. New identity. Eden, Box 8410-PC, Fountain Valley, CA 92728.

FREE Promotional Albums, Concert Tickets, Stereos, etc. information: Barry Publications, 477 82nd Street, Brooklyn, NY 11209

TREASURE? Black and white photo of loved one fading away? Outstanding artists create superb living likenesses, flesh colors. Details \$1.00. Meno Studio, 110 Rathburn, Islington Ontario, M8A 1R7 Canada.

STOP GETTING SPEEDING TICKETS. Order my 8 page booklet, packed with little known secrets. Send \$4.90 to: **STOP TICKETS**, 211 Condon Ave., Ben Lomond, CA 95005

POKER MAKE MONEY increasing your odds. expert reveals secrets of poker psychology. \$3.00 to: Protach, 86-37 259th Street, Floral Park, New York 11001

MIND-POWER Course Makes Millionaires. Complete. Comprehensive. Proven. Send For It Now. \$9.95 To: M. Sinclair, 13610 N. Scottsdale Rd. Suite 10196, Scottsdale, AZ 85254

SECRET Drink Book 101 Authentic Recipes! Served in Little Aud's Saloon 20 years. Check or M.O. \$10.00pp. Aud, 5560-pl Elk-Dr., Belvidere, Ill. 61008.

HOMEOWNERS! Get a **COMPUTERIZED AMORTIZATION SCHEDULE OF YOUR MORTGAGE** or loan. Have the Facts today. **FREE DETAILS!** Write: Dept. PM7, 2318 Pierce St. NE, Minneapolis, MN 55418

JOIN the organization of the 1990's today! Discover the benefits of Charter Membership. Free information. National Association of Baby Boomers, Inc., Dept. PX-1, Box 15242, Reading, Penna. 19612.

WOMEN'S INTERESTS

CANNING Lids - Save! (Flats) case \$32: 60 dozen regular (#70) or 36 dozen wide-mouth (#86). Half-case \$17. Small lids (#83) 10 dozen, \$8. Ring sets (#83) two dozen, \$5.25. Satisfaction guaranteed. Gardener's Kitchen, Box 412PM, Farmington, CT 06034.

GOVERNMENT SURPLUS

NARCOTICS RAID SEIZURES... Autos... Vans... Boats... Airplanes... Millions Surplus Bargains... many 1% original cost! "Nationwide Sales Directory"—\$3.00. Disposal, Box 19107-AT, Washington, DC 20036.

LOANS BY MAIL

LOANS by mail! Instant reply! Rush stamped addressed envelope: Marigold, Box 2030, Richardson, TX 75080.

VISA® Mastercard® Simple Effective Guaranteed Program. 1-800-826-8902 (California) 1-800-843-4046.

FREE MONEY! \$300,000,000 Giveaway. Grants. Never repay. Details \$1.00. Jakla, Box 3066-PM77, Seminola, FL 33542

BORROW \$40,000 "overnight." Any purpose. Keep indefinitely! Free Report! Success Research, Box 19739-AT, Indianapolis, IN 46219.

VISA/MASTERCARD! Quick Personal/Business Loans! Refused elsewhere? Write! National Finance, Box 35726FN, Richmond, VA 23235.

MONEY Problems? Free Book describes Loans. Cash, Government Grants, Other benefits, available to individuals. Write: Associates, Box 98-AX, Brooklyn, New York 11235

BORROW \$500 - \$40,000 on Signature! 97% Eligible! Any Purpose! Free Application: United, Box 3789M, Downey, CA 90242.

NEED MONEY? Cash, Loans, Government Grants, 99% eligible-no investigation. KPA, Box 400PNM, Jamesport, New York 11947

BORROW \$100,000. OVERNIGHT Action. Guaranteed. Rush SASE: Financing, Box 3923, Abilene, TX 79604-3923.

BORROW \$500-\$40,000! "Overnight" On signature. Keep indefinitely! Action #R-7, 3660 Wilshire, Los Angeles, CA 90010

CASH GRANTS FOR SMALL BUSINESS. To start or expand your business. Free details. Ralph McGill, 322 N. 10th Ave. E., Duluth, MN 55805

"LOANS By Mail" Need Cash? Government Grants - No Investigations - Loans Available To Everyone: Credit Bank, Box 4039 NCP, Parkside Sta., Forest Hills, N.Y. 11375

(Continued on next page)

LOANS BY MAIL

(Continued from preceding page)

SIGNATURE Loans Confidential Transactions Handled Entirely By Mail Send \$3.00 LSASE. Stat Publications, 23010 Lakeforest Dr., Ste. D-306, Laguna Hills CA 92653

WANT VISA? MASTERCARD? Tired of being denied! Get preliminary telephone approval in seconds! Poor credit now accepted! Call BankCard Services now! Toll Free- 24 Hours. 1-800-554-8472.

BORROW Cash Fast! 24-Hour Response! Write: NRCPA, Box 2440, Midland, MI 48641.

MONEY PROBLEMS? Guaranteed results! Instant reply. Details \$1.00. C & J Marketing, Dept. P 432 Washington Street, Weymouth, MA 02188. 617-337-4425.

VISA/MASTERCARD! Guaranteed. Poor Credit? No problem. Order Now! \$14.95. Security Credit, Dept. PM. 1118 Oakway Ct., Nashville, TN 37214

DIVORCE

WINNING Information \$2.00 **MEN'S RIGHTS ASSOCIATION**, 17854 (Lyons), Forest Lake, MN 55025

PERSONAL

BORROW \$5,000. No Credit Or Employment Needed. 24 Hrs. Call (702) 789-9299.

BECOME A CARD CARRYING ATHEIST, DETAILS: BOX 8M, SOMERSET, MA. 02726

REMAILING SERVICE

TRUSTWORTHY forwarding. Stamped remails \$1.00. Diamond-H, Box 129A, Caddo, Texas 76029.

FREE Remailers List. Agents Needed. PS. Box 29656, San Antonio, Texas 78229

UNLISTED ADDRESS Discreet and confidential. Remail \$1.00 Single. Mail Forwarding Service, 8050 S. Main, Houston, Texas 77025

CONFIDENTIAL Mail Receiving/Forwarding. Mail Drop. Box 608039PM, Orlando, FL 32860

CONFIDENTIAL, Unlisted Forwarding Address. Remails \$1.00. MS, Box 31511, Phoenix, AZ 85046

YOUR PERSONAL OVERSEAS ADDRESS, Manhattan, Suite 602, 38 Soi Langsuan, Bangkok 10500 Thailand

NH STREET Address. Remailing. Forwarding. Details SASE \$1.00 refundable. Mailings 57 South River, Bedford, NH 03102.

SECURITY, Confidentiality. Details: Consumer Warehouse, 6333 Pacific #508, Stockton, CA 95207

REMAILS \$1.00 Monthly Service \$7.00. Frank, Box 45181, Little Rock, Ark. 72214

FREE Details! Postal Shoppe, 369 East 900 South, Salt Lake City, UT 84111

WANTED MISCELLANEOUS

BUYING Tungsten Carbide, Tungsten, Molybdenum, Silver Solder, Silver Contacts, Gold, Platinum. 800-321-6914 Ohio 216-531-8333 collect.

GOLD, Silver, Platinum, Mercury, Tantalum. Samples Evaluated Free. Ore Assaying Service. Call Wholesale Terminal Toll Free: 1-800-932-1010.

SCRAP SILVER CONTACTS, FORK LIFT CONTACTS, Silver Solder, Sterling, Gold Plated. Robert Leszczak, 652 Myrtle St., Elizabeth, NJ 07202

PERFECT KNOWLEDGE

SURVIVE under Universal Law into Millennium as Godated by **CREATOR'S** original **MEASURES**, embracing **TOTAL** knowledge for unlimited free **ENERGY**; monadic gravity, friction-free, work/Travel **VEHICLES**; instant **MANNA**. Do not write. Must prove yourself. **ATA** Base, 1500 North Texas, Weslaco, Texas 78596

HEARING AIDS

HUGE SAVINGS Eliminate Dealer Markups. Free Trial. Batteries Wholesale. Terms Arranged. Call Toll Free 1-800-323-1212. Or Write: Lloyds-PMC, Rockford, IL 61110

FREE HEARING AID CATALOG- Save 1/2 by mail! Write: "MoneySavers", 9530PM-7 Langdon, Sepulveda, California 91343.

SCIENCE & CHEMISTRY

ANATOMICAL CHARTS, MODELS, SKELETONS, \$1.00 Catalog. **CHARTS**, 7124 North Clark, Chicago, IL 60626

FREE SCIENTIFIC SUPPLIES AND CHEMICAL CATALOGS. R.J.M. Laboratories, Inc. presents its latest catalogs containing scientific laboratory equipment, supplies, chemicals and a complete line of specialty laboratory glassware. Write today for your **FREE** catalogs: R.J.M. Laboratories (IL), Box 899, Santee, CA 92071

LABORATORY CHEMICALS, GLASSWARE - APPARATUS. Established 1953 - Catalog \$1.00. **HAGENOW LABORATORIES**, 1302 Washington, MAINTOWOC, WISCONSIN 54220

FORMULAS, PLANS, ETC.

MONEYMAKING CHEMICAL PRODUCT FORMULAS! SOLD SEPARATELY - BUY ANY AMOUNT! CATALOG LISTING THOUSANDS ONLY \$5.00 (REFUNDABLE) GWA3, Box 193, Brookfield, Wis., 53008-0193.

ENGINEERING Conversion Factors \$6.00. Rocky Harris, 315 Spring, Haysville, Kansas 67060

SPECIAL SERVICES

INFORMATION On anything. Ferguson Research Specialists, 60-15 Woodside, Woodside, New York 11377.

PERSONALIZED name and address stencil. 1/2" lettering. Professional, reusable. **GUARANTEED**. \$3.00 ppd. Stencilcraft, Box 104, Morris, Ill. 60450

MICRODOT Identification custom made for you. Protect anything. Almost invisible. Write for info. IDot, Inc., P.O. Box 6738, Lake Charles, LA 70606

HEALTH, VITAMINS

PSORIASIS Sufferers: Discouraged? Write for Free Important Information that is helping thousands. Pixacol, P.O. Box 26117PM, Dallas, TX 75228

HOW I BEAT HEART ATTACK

FREE powerful secrets. Cleansed my arteries. Proof of remission from heart attack, blocked arteries, chest & arm pain, other. Write: Heart-15, Box 3256, Austin, TX 78764.

WORK CLOTHING

OSK B'Gosh work clothes (Railroadiana) Free Catalog. Depot, Dept. PC. Sullivan, Illinois 61951

GARDENING & LAWN CARE

AUTOMATIC SPRINKLER SYSTEM. Six zones for under \$100., using the hoses and sprinklers you already own. Complete easy to follow instructions, diagrams, and material list. Send \$3.00 to: L & L Enterprises, Box 990044, Contract Station #30, Denver, Colorado 80209

FLOWERS, PLANTS & NURSERY SUPPLIES

FRESH AND SILK FLOWER arranging made easy! \$4.00. Karen Ross, 110PM Lurene, Fremont, CA 94539.

RECIPES, COOKING, ETC.

JUST GOOD COOKIE COLLECTION \$3. DJ Enterprises, POB 16, East Orland, Maine 04431

TWO COOL, REFRESHING, SCRUMPTIOUS DESSERTS \$2.00. South Park Distributors, P.O. Box 445, Wheat Ridge, Colorado 80033.

SINGAPORE LADY will share favorite authentic Oriental recipes. \$3.00. LSASE, P.O. Box 4692, Culver City 90231

LOVE PASTA? HERE'S SHEER DELIGHT FOR \$3.99. "20 DELICIOUS PASTA RECIPES." P.O. BOX 343, MIDDLETOWN, PA 17057

DELICIOUS Korean barbecue sauces. \$3.00. Kimmik, P.O. Box 43006, Upper Montclair, N.J. 07043

CATCH THE CRAVE: old family secret recipe, boiling delicious Cajun Crawfish, send \$2.00. Rt-13, Box 534F, Lake Charles, LA 70611

SUPERB CHICKEN CURRY Recipe with Curry Powder \$5.00. Annie, Box 7124, Sacramento, California 95826

PRALINE FAMOUS RECIPE, Easy, delicious. SASE \$2.00. 966 W. Grenada Terrace, Macon, GA 31206.

"BEER BREAD RECIPE" \$2.00-SASE. Conway Country Press, P.O. Box 4PM7, Conway, MO 65632-0004

COUNTRY EPICURE! 22 International Peasant Entrées. Simple! Exotic! Delicious! \$5.00. Rosedale Features, Box 1915PM, Staten Island, NY 10314

25 CALORIES! Honestly **SATISFYING** chocolate desserts. Three recipes. \$1.00. SASE. Margaret Harper, 438 Sixth Street N.E., Washington, DC 20002

SUGAR FREE ICE CREAM! Ten Original. All Favorites, Hi-Protein, Fruit and More! \$2.00: Trade Discount, Box 31502, Palm Beach Gardens, Florida 33410.

MEXICAN Tamale recipe, learn to make, delicious. \$3 cash, M.O., SASE. Tamale, Box 130357, Birmingham, AL 35213

QUICK, NATURAL, NUTRITIOUS Recipes. By Mother of Eight \$2.00. Robinson, Route 3, Box 755, Newton, North Carolina 29858

SPICY Italian Meaty Spaghetti/Pasta Sauce. Plus an easy, creamy Pineapple Decadence pudding recipe. Also a low-cholesterol version of both. SASE \$2.00. Delights, P.O. Box 7644, Everett, WA 98201.

"SWEET TOOTH" RECIPES FROM MOM AND GRANDMA - SOME FROM 1935. Over 50 recipes. Send \$5.00: GARLE, Box 86129-PM7, Phoenix, Arizona 85080.

AUSTRALIAN Cooking. 25 Unique Recipes. \$4. AUSCAN, P.O. Box 8014, Blaine, WA 98230

HOMEMADE Barbeque Sauce Recipes, Send \$3.00 To: Fabos, 10146 Ewing, Chicago, Ill 60617

CHEESEBURGER PIE Dad, Kids Favorite Send \$1.00. Recipes, 1422 14th St. E., Bradenton, FL 33508

INDIAN FRY BREAD. Make your own. Recipe. Send \$3.00. SASE: GARLE, Box 86129-PM7, Phoenix, Arizona 85080.

SCRIPTURE cake. Plus nine more, \$3.00. "Good Cooking", Box 243, Chaumont, New York 13622

POPCORN LOVERS make delicious cheese popcorn at home. Kit makes approximately 21 qts. \$15.95 + \$3.50 postage/handling. El'Dee Enterprises, Dept. B587, 343 Somerset Drive, Streamwood, IL 60107.

RICH and Famous Casanova Cheesecake and two other wonders \$6.00. Rich, 2 Bloor West #100-105, Toronto, Canada M4W 3E2.

40 DELICIOUS ZUCCHINI RECIPES. Appetizers to Desserts \$4.00. Kap Enterprises, P.O. Box 176, Hewitt, Texas 76643-0176

CHEF Owen's Cook Book With Friends \$6.95. \$1.00 P&H. Lawler, 76 Wesley Ave., Atlantic Highlands, N.J. 07716

SOUTHERN RECIPES. 5 of The Best. Send \$3.00 to: J&S Publishing, P.O. Box 250, Spartanburg, S.C. 29304.

BREAD BOOKLET 75 RECIPES Plus Sourdough Starter \$5.00 Plus 90c Postage and Handling To: Burns, 309 S.E. 3rd, Hoxie, AR 72433

OLD ENGLISH family drinks. Three recipes. Wholesome ingredients. Includes **TRADITIONAL GINGER BEER PLANT**. \$4.00. Gawsorth Press Inc., Box 1705, Alexandria, Ontario, Canada K0C 1A0

WINEMAKING, BEERMaking, ETC.

WINEMAKING-BEERMaking-GASOHOL. Free Supply Catalog. Yeast Equipment. Continental, Box 186PM, Casselberry, FL 32707

MAKE QUALITY BEER. Wine. Free Catalog. Root & Vine, Box 3051PM Westport, MA 02790.

WINEMAKERS-Beermakers Free Catalog. Low Prices. Free Recipes. Cellar-M, Box 33525, Seattle, WA 98133

WINEMAKERS-BEERMakers: FREE ILLUSTRATED CATALOG OF SUPPLIES. SEMPLEX, BOX 11476R, MINNEAPOLIS, MINNESOTA 55411

WINEMAKERS-BEERMakers - Free Catalog - Fast Service - Large Selection: Kraus, Box 7850-L, Independence, Missouri 64053

BEERMakers ONLY! FREE Catalog/Newsletter. William's, Box 2195-M7, San Leandro, CA 94577

BEERMaking - WINEMaking Catalog. Lowest Prices. **BEERGear**, Box 25093N, Lansing, Michigan 48908.

WINE/BEER MAKING Catalog: B&J Enterprises, 1845 South 19th, Springfield, Illinois 62703

BURGLAR ALARMS & HOME PROTECTION

BURGLAR Alarms for home and car. Free brochure. Inexpensive. Guaranteed. Terry & Company, Box 544, Tupelo, MS 38802

INSTALL A PROFESSIONAL ALARM SYSTEM in your home or business in hours. **SUPERVISED WIRELESS SYSTEM**. Batteries last 5-8 years. Discount prices. National Monitoring Available. \$3.00 for information. **VIKING**, Box 2414, Leesburg, VA 22075

TIME MACHINE

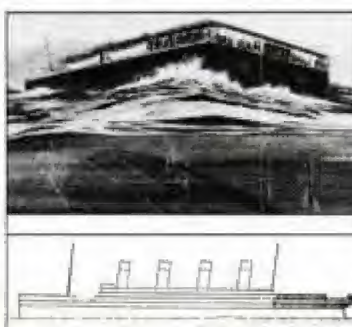
75 YEARS AGO: July 1912



Stowing folding lifeboats.

After The Titanic

The shocking loss of the White Star Line's *Titanic* sparked some interesting innovations to avert future tragedies at sea. PM's cover subject was the collapsible lifeboat, a lightweight, easily stowed alternative to no lifeboat at all. Completely enclosed lifeboats were also being planned to protect survivors from exposure. But perhaps the most ambitious suggestion involved a watertight detachable ship's compartment, right. As envisioned, the entire upper works of a doomed ship's af-



Sinking solution: a breakaway stern section.

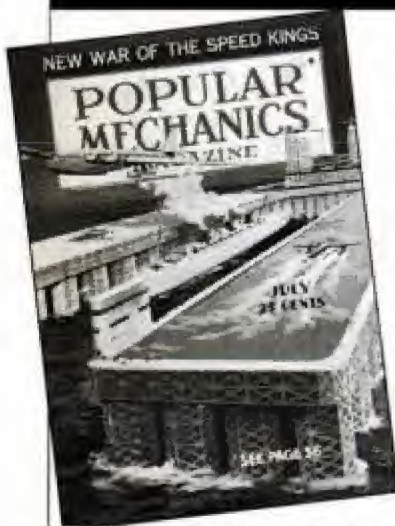
ter section would break away when disaster struck. Passengers would crowd into the fantail and the crew

would release the escape pod from the sinking hull.

All-Wheel Steering

The recently revived concept first appeared in 1912 on an 8-wheel motor truck. Each wheel had an independent electric motor, powered by an internal-combustion generator fueled by gasoline. In theory, these drive motors were to be attached to each wheel, eliminating drivetrain components like universal joint and differential. The rear wheels turned out automatically when the front wheels turned in.

50 YEARS AGO: July 1937



A flexible transportation hub.

Mid-Oceanic Port

Nonstop, transatlantic flight was still a distant dream in 1937, so PM proposed a mid-ocean port for airliners, amphibians and passenger ships. The Heiser Seadrome, as envisioned, was a U-shaped floating transportation facility that included a 2000-ft. tank for seaplanes, a 2000-ft. strip for land-based aircraft, and docking facilities for Queen Mary-class liners. Pontoons submerged 150 ft. below the surface would supply the necessary buoyancy to support the scheme, and wind-driven electric genera-



The steam iron gets a start.

tors would power subsea propeller systems so Seadrome faced the wind.

Way Back When

A half-century ago, PM reported on the invention of an iron that steam-dampened clothes at the press of a button. Like the radio and TV, this simple device found its way into practically every American home.

Telemetry Based

Scientists at the Bartol Research Foundation had perfected a radio transmitter that, when carried aloft by four small balloons, sent back to ground personnel a short-wave radio signal indicating altitude.

25 YEARS AGO: July 1962



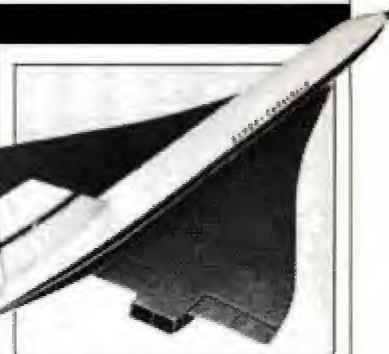
Our underwater frontier.

Beneath The Sea

Scuba equipment, was well-established in underwater exploration 25 years ago. But innovators didn't stop trying to develop new ways to exploit our underwater resources or discover treasure. PM presented several tools for underwater explorers, including the first television cameras, electric propulsion units, towed diving planes and hydrostatic dredging units. Perhaps most intriguing was a handheld, underwater sonar with earphones that spotted objects over 120 yards away.

An SST Is Born

Meanwhile, aerodynamicists in France, not content with subsonic passenger flight, were beginning initial development of what eventually became the Concorde. Originally conceived by the French government as the Super Caravelle, the aircraft would fly at Mach 2.2 close to 50,000 ft. high, giving 100 passengers a 2800-mile range. The PM vision became a reality, and now the Concorde boasts daily transatlantic service by British Airways and Air France.

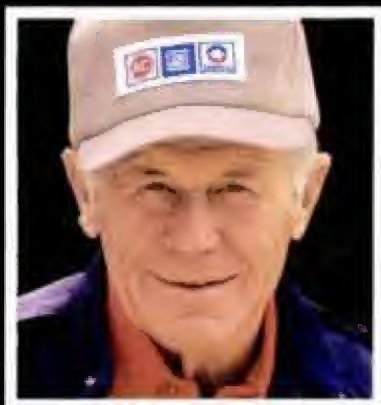


Genesis of the Concorde.

ATV Forerunner

A 4-wheel, balloon-tire utility vehicle, Desert Rat, with a 1-lunger engine, carried people and equipment 20 mph on rough terrain. **PM**

POPULAR MECHANICS (ISSN 0032-4558) is published monthly by The Hearst Corporation, 234 West 57th Street, New York, NY 10019, U.S.A. Subscription prices: United States and possessions, \$13.97 for one year; \$23.97 for two years. Canada and all other countries, add \$16.00 for each year. Second-class postage paid at New York, NY, and additional mailing offices. Authorized second-class mailing-in-Canada privileges by Canada Post, Windsor, Ont. Registered as second-class matter at the Post Office at Mexico D.F., Mexico, June 20, 1950. © 1987 by The Hearst Corporation. All rights reserved. Printed in U.S.A. POSTMASTER: Please send address changes to Popular Mechanics, P.O. Box 10064, Des Moines, IA 50303.



"WITH PARTS LIKE THESE, \$7 BACK IS ICING ON THE CAKE."

— Test Pilot Chuck Yeager

These days, AC-Delco's sweetening the pot with more than top-notch parts. We're offering up to \$7 in rebates.

May 17, 1987, through July 18, 1987, get \$1.50 apiece back on AC air filters (limit 2). \$1.00 apiece back on AC oil filters (limit 2). And 25¢ apiece back on AC spark plugs (limit 8).

Your rebate requests must reach us by August 31, 1987. So see your AC-Delco retailer for coupons and details. To find your nearest retailer, call me toll-free at 1-800-AC-DELCO.

Keep in mind, a deal like this doesn't come around too often. So if you maintain your car yourself, I'd suggest you get over to your AC-Delco retailer today.

Offer void where prohibited

**Stay ahead of trouble
with AC-Delco.**



GENERAL MOTORS CORPORATION



Get the flavor of these leading brands, but less tar.



Breakaway to Merit.



Breakaway to flavor.



Kings: 8 mg "tar," 0.5 mg nicotine av. per cigarette, FTC Report Feb. '85

**SURGEON GENERAL'S WARNING: Cigarette
Smoke Contains Carbon Monoxide.**

Comparisons based on king-size version of products shown
and "tar" levels from Feb. '85 FTC Report or by FTC method.

© Philip Morris Inc. 1987